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Manager and Secretary: E. S. MIDDLETON.

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Contents:

	PAGE
Apprenticeship and Training	181
Rural Electricity Supply	182
Our Foreign Electrical Trade—a Comparison	182
Railway Electrification in India (*illus.*)	183
Regulations for Overhead Lines.—I, by Alfred Ekström and Vidar Ekström (*illus.*)	185
Imperial Communications, by Lt.-Col. Chetwode Crawley	189
Apprenticeship and Training	190
Legal	192
Business and Industrial Notes	194
Lighting and Power Notes	196
Tramway and Railway Notes	198
Telegraph and Telephone Notes	198
Radio Notes	199
Contract Information	199
Notes	201
Our Personal Column	203
Financial Section—	
New Companies Registered	204
Official Returns of Electrical Companies	205
City Notes	205
Stocks and Shares	207
The Electrical Imports of Peru	209
Economic Conditions in Portugal	209
The Hydro-electric Power Commission of Ontario	210
The Public Lighting Conference	211
Visibility in Streets, by J. M. Waldram	211
Rural Electricity Supply	213
The International Union of Producers and Distributors of Electricity	215
Selected Radio-Telephone Apparatus (*illus.*)	216
Correspondence—	
Electric Wood-working Machines	217
Past and Present Conditions of Jointing	217
Domestic Lighting and Heating and their Influence on Load Factor	218
House-Wiring Specifications	218
"Earthing" and the Public	218
Electricity Supply	218
Installation Costs	218
Parliamentary News	219
Published Specifications	219
Trade Mark Applications	219
New Work for Contractors	220

Apprenticeship and Training.

A LONG overdue awakening of interest in apprenticeship and training appears to be taking place throughout British industry. At least three of this year's publications of H.M. Stationery Office indicate that the importance and urgency of this question are realised by the Government Departments concerned with industry and education, and the formation of a special committee by the Engineering Employers' Federation to inquire into the apprenticeship problem is ample evidence that the engineering industry is fully alive to the seriousness of the present position.

Even were it true, there would be little practical assistance to be gained from the oft-repeated statement that apprenticeship is out of date and incapable of catering for present-day industrial conditions. What is needed is a satisfactory substitute for apprenticeship: a system of training which will enable the industrial forces of the future to meet the needs of their day and generation at least as adequately as the apprenticed craftsman met the problems of the past.

In the recently-published Ministry of Labour "Report of an Inquiry into Apprenticeship and Training in Engineering, Shipbuilding and Ship-Repairing and other Metal Industries," reviewed in this issue, there are some paragraphs which serve as pointers to the tendencies which are to-day influencing the apprenticeship problem. Some of these tendencies may be transient and attributable to post-war conditions, but some of them are undoubtedly permanent and progressive and are consequently deserving of very careful attention in so far as they must affect the recruitment and methods of training of the boys who enter the electrical industry.

Of the 2,534 firms upon whose returns this report is based, 62 per cent. employed apprentices or learners, but it is significant that the proportion of firms not employing apprentices was found to be greatest in motor engineering, tramway and omnibus maintenance, and electrical and mechanical engineering, in each of which about one half of the firms had no apprentices or learners. One important passage of the report focuses attention on two of the most important tendencies in modern industry: first, the failure of many concerns to train their own skilled employés, necessitating systematic "piracy" of craftsmen from other firms; and, secondly, the sub-division and mechanisation of processes enabling many concerns to operate with a minimum of skilled labour, the system of "up-grading" providing a sufficient supply of process workers.

It is obviously not the function of this Government report to do more than relate the observed facts and tendencies, but the engineering employers of Great Britain are faced with the grave responsibility of dealing with these facts. Reasonable interchange and transfer of skilled men in the industry is highly desirable and healthy; but for one concern to depend upon another for its skilled training is a practice to be deprecated as unsound both from the point of view of economics and that of the maintenance of high standards of craftsmanship. That such a practice prevails indicates that some firms are involuntarily constituting themselves nurseries of skilled mechanics; also that even among those who fail to train their own men there is an appreciation of the value of a proper apprenticeship.

The question of up-grading in the more mechanised branches of the industry and its relation to apprenticeship in its ordinarily accepted sense presents a much more difficult problem. That it cannot of itself replace apprenticeship would be generally admitted; but some scheme whereby a system of up-grading could be made to work alongside the more complete training of the fully-skilled mechanic may be considered as a possible solution of the problem. In any case, there emerges one obvious deduction from this growing tendency, namely, that so far from the sub-division and planning of industrial operations reducing the necessity for training, it is now necessary to train *every* boy in order that promotion may be made with a maximum of efficiency.

While, therefore, the methods of the past have been concerned mainly with the training of the apprentice up to the standard of the average mechanic, leaving the semi-skilled and unskilled to fend for themselves, future policy is likely to involve a general training of all juvenile workers with a view to progressive grading as operatives and process workers, while a more intensive training of selected boys will provide the type of super-mechanic upon whom industry now tends to depend.

Referring again to the report, it is clearly indicated that the past decade has seen a great accession to the value placed on technical education as part of the training of the apprentice. The National Certificate scheme inaugurated by the Institutions of Electrical and Mechanical Engineers in collaboration with the Board of Education and local education authorities has done much to stimulate this appreciation among both masters and apprentices.

The extent to which technical education has been encouraged by employers is shown even more clearly in an appendix to another recent Government publication—the Malcolm Report on Education and Industry. Here we find that both electrical and mechanical engineering firms stand far above the average of other industries. In granting time off during working hours, provision of works classes, employment of apprentice supervisors, and in many other ways the engineering industry definitely leads in the encouragement of its employés to further their education.

Having led so definitely in the training of its young workers, there now confronts the engineering industry another equally important problem—the adequate bridging of the gap which so often separates the school education and the works education of the apprentice. It is true that there are indications that boys are tending to enter apprenticeship in greater numbers direct from central, trade, and secondary schools at the age of 16 and over. But there remain the greater number who leave school at 14 and, unless some special steps are taken, do not resume their education until constrained to do so on entering apprenticeship at the age of 16. The Malcolm Report reviews the two alternatives, the raising of the school-leaving age and the compulsory day continuation school, and very judiciously refrains from making any recommendations on these matters. No doubt the Apprenticeship Committee of the Employers' Federation is also reviewing these alternatives, and we venture to hope that it will come to a more definite conclusion. We would suggest that the time is ripe for the engineering industry, whose vital interest it is that this gap in the training of its young workers should be closed, to express itself definitely on this matter in order that some progress may be made towards its settlement. It is surely not beyond the capacity of our industrial and educational leaders to hammer out a policy which will be generally acceptable, and moreover, one which will assure us of a better general equipment of the rising generation to meet the ever-increasing difficulties of industrial life.

Rural Electricity Supply.

Eight months after it was convened by the Electricity Commission, the Conference on Electricity Supply in Rural Areas reported, and the Commission decided to arrange for the immediate publication of the report without waiting for its contents to be considered officially. This desire to expedite matters is most laudable, for the whole subject is of some moment. The report is considered to mark a very important stage in the rural electrification of this country.

The three Sub-Committees which were appointed by the Conference have had placed at their disposal a considerable amount of official statistics and other data, as well as detailed reports and information compiled by their members, bearing upon the nature and extent of the potential demand for electricity in rural areas. They have necessarily had to confine their attention to a broad review of the subject, as a detailed investigation of the many aspects of the general problem would have occupied considerable time and have precluded the issue of an early report.

Nevertheless, the Sub-Committees have formed broad conclusions and have been able to indicate directions in which they deem further action, or investigation, to be necessary. The general observations of the Conference are reviewed elsewhere in this issue and its recommendations outlined. The report contains a mass of informative data and statistics which will repay careful study. The Conference suggests that it should be convened again, say, a year hence, so that it may consider to what extent its recommendations have been acted upon meanwhile. It is to be hoped that it will not be disappointed with the progress that is then recorded.

Our Foreign Electrical Trade —a Comparison.

In last week's *Board of Trade Journal* there appeared a set of tables relating to our import and export trade in which values and quantities during the first six months of this year are compared with the corresponding figures for the first half of 1924. These show very plainly the falling tendency of prices, or, at any rate, the importation and exportation of cheaper products.

For the purposes of the comparison, the quantities for the 1928 period are given as percentages of the 1924 figures, together with the actual declared values. Then it is calculated what the 1928 amounts would have been at 1924 values, and these figures are given as percentages of the 1924 values.

On this basis, so far as the total retained imports are concerned, while the quantity rose to 117.4, there was a fall in value to 87.4. Imports of electrical goods and apparatus rose in volume to 154.4, but the value was only slightly above the 1924 figure—100.7. Electrical machinery is not shown separately, but the machinery class in which it is merged reflects lower prices to a very marked degree. While quantitatively imports increased to 173.0, the value fell to 97.0.

The tendency is not so pronounced in the case of exports, but it is still manifest. The total exports expressed as a quantity are given as 105.3 and the value as 86.2. Electrical goods and apparatus rose to 129.5, while the value fell to 96.0. At the same time, the exports of machinery (including electrical machinery) rose in quantity to 132.9, but declined in value to 97.3.

Railway Electrification in India.

Some details of the 2,250-h.p. high-speed passenger locomotive built by the General Electric Co., Ltd., and R. & W. Hawthorne, Leslie & Co., Ltd., for the Great Indian Peninsula Railway.

In a recent issue* we briefly described one of the three trial electric express passenger locomotives built for the Great Indian Peninsula Railway and constructed by three well-known firms to the specification of Messrs. Merz & McLellan. Another has just been completed, and we were recently privileged to inspect it at Newcastle-upon-Tyne.

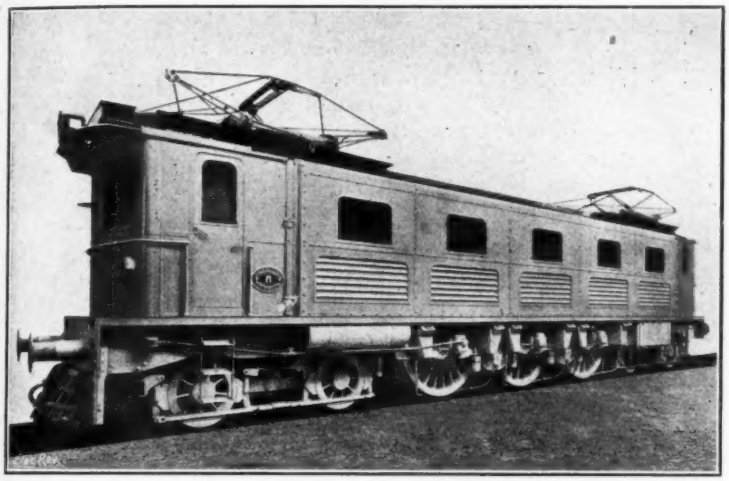


Fig. 1.—High-speed Passenger Locomotive.

The main frame and mechanical parts have been constructed by Messrs. R. & W. Hawthorne, Leslie & Co. at their locomotive works at Newcastle, and the whole of the electrical gear, which has been manufactured by the General Electric Co., Ltd., has been assembled on the locomotive at Newcastle. The General Electric Co. has acted as the main contractor, and been responsible for the general design of the complete locomotive. At the inspection about fifty visitors were present, including representatives of the leading British railway companies, consulting engineers, and others.

* Elec. Rev., May 11th, 1928.

The locomotive is of the 2-A-A-A-2 type, having three main driving axles arranged for individual drive and a guiding bogie at each end; its general appearance will be seen from fig. 1. The principal dimensions, weight, power, &c., are indicated in Table I.

The locomotive is designed to exert a tractive effort of 24,000 lb. up to a speed of 36 m.p.h., and 6,300 lb. at 70 m.p.h., and, although its normal maximum running speed does not exceed 75 m.p.h., it is actually designed for a maximum speed of 85 m.p.h.

The three main driving axles are each driven independently by a pair of motors. The two motors of each pair are fitted with pinions driving a gear wheel mounted at one end of a quill, which runs in bearings rigidly attached to the motor frame. The drive is transmitted to the axle from the other end of the quill by means of the "Yoke" drive, which has been specially designed to allow for uniform and smooth transmission of the power under varying conditions of eccentricity and angularity between the centre line of the quill and the centre line of the axle. This drive is illustrated by figs. 2, 3 and 4. The drive frame which is mounted on the quill carries the link mechanism by means of which the drive is transmitted to the main driving wheel. The arrangement of the link mechanism is such as to allow of considerable movement of the axle relative to the quill, and any angularity is taken care of by means of the spherical bearings employed for the connecting links between the forked frame and the pins on the driving wheel. A special feature of this drive is that the quill runs in bearings attached to the motor frame, and as the latter is rigidly attached to the locomotive frame, there is a minimum amount of unsprung weight, resulting in minimum wear on the track.

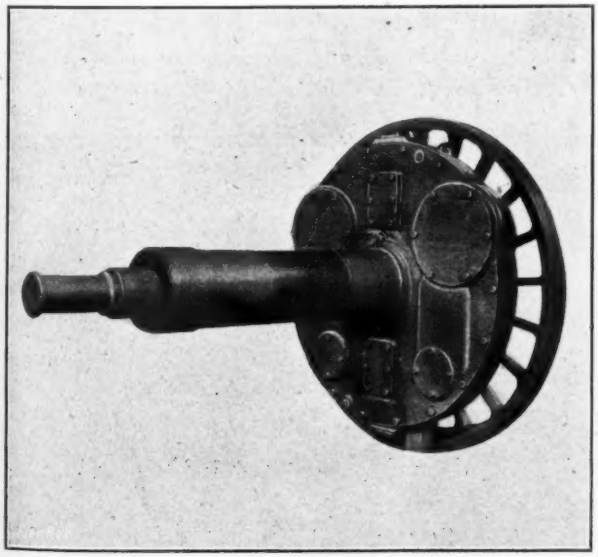


Fig. 2.—Driving Axle with Quill and Flexible Yoke Drive.

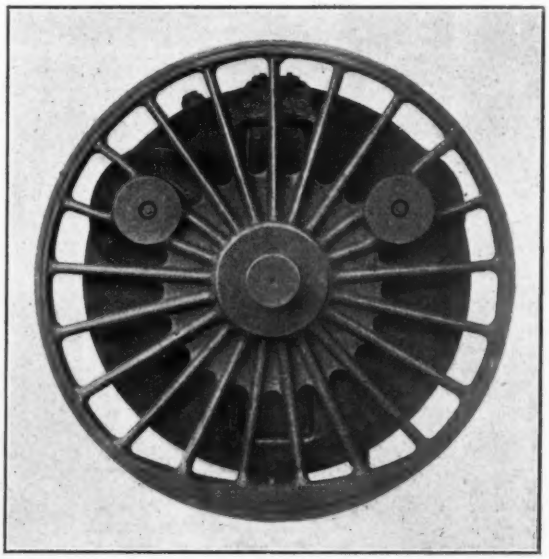


Fig. 3.—Driving Wheel (without tyre) and Flexible Yoke Drive Casing.

In order to obtain smooth transmission of the torque between the motor pinions and the gear wheel, the latter is mounted on a spider keyed to the quill, and the drive

is transmitted from the wheel to the spider through a set of laminated springs, as illustrated in fig. 5. The main driving motors are substantially constructed, the frames being cast-steel. Forced axial ventilation is employed, air being passed, not only over the armature and the field coils, but also through ducts in the armature cores. The air supply is provided by a motor-driven blower, and the exhaust air from the motors passes through the resistance chamber and up through louvres in the roof. The average supply voltage is 1,400 V, and, as there are always at least two armatures in series, there is a normal maximum of 700 volts across any armature.

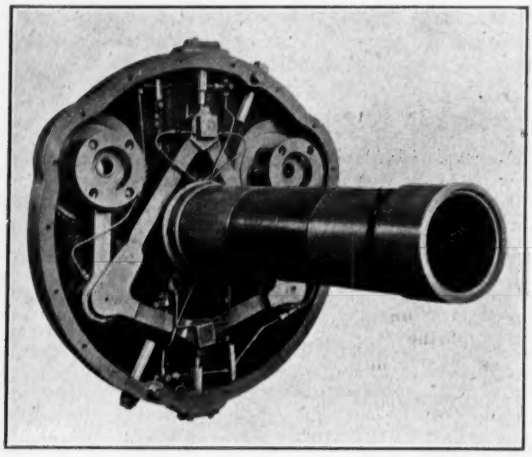


Fig. 4.—Quill and Flexible Yoke Drive (cover removed).

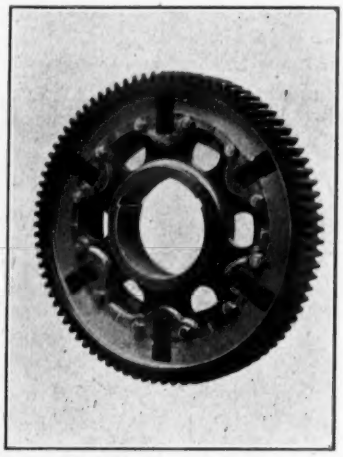


Fig. 5.—Flexible Gear Wheel.

Table I.—Locomotive Data.

Track gauge	5 ft. 6 in.
Total length over buffers	56 ft. 2¼ in.
Rigid wheelbase	15 ft. 0 in.
Bogie wheelbase	7 ft. 0 in.
Driving wheel diameter	6 ft. 2 in.
Bogie wheel diameter	3 ft. 0 in.
Overall width over platform	10 ft. 0 in.
Hourly rating	2,250 h.p.
Speed at hourly rating	36 m.p.h.
Continuous rating	2,130 h.p.
Speed at continuous rating	37 m.p.h.
Normal maximum running speed ...	75 m.p.h.
Total weight of locomotive	108 tons.
Supply pressure	1,500 volts d.c.

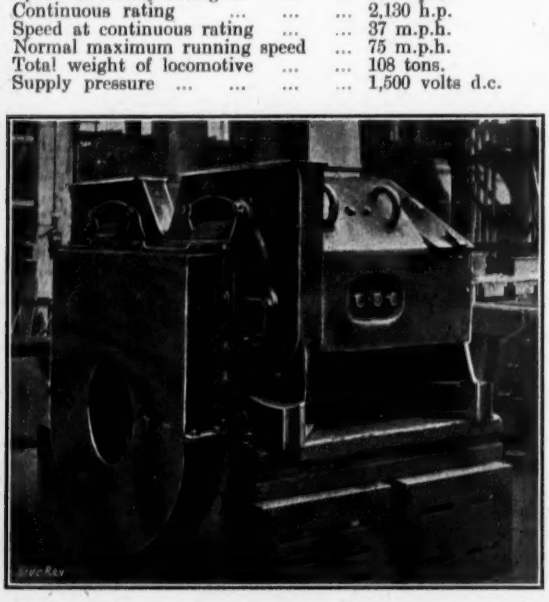


Fig. 6.—Main Motor, Twin Armatures.

The control system is arranged to give series connection with six armatures in series, series-parallel with two parallel groups of three in series, and parallel with three parallel groups of two in series. Resistance steps are provided in each motor grouping, there being thirteen series notches, ten series-parallel notches, and ten parallel notches, thus ensuring very even starting. In addition, two weak-field notches are provided, capable of use in any one of the three motor groupings. The method of field control adopted is by field shunting, inductive shunts being used for this purpose, proportioned to give the same time constant as the main motor fields.

The control system is of the electro-pneumatic type, the line switches, resistance switches, and combination switches consisting of compressed-air-operated contactors, whilst the reversing switches are of the drum type, also air operated. The reversing switches are also used as cut-out switches for disconnecting any of the motors from the main circuit. All air valves on these switches are operated electrically from a 50-volt supply obtained under normal conditions from a motor-generator set, the motor of which takes a supply from the 1,500-volt system. The valve-operating circuits are controlled from the main master controllers, one of which is mounted at each end of the locomotive. These controllers are fitted with three handles, one for reversing, one for grouping motors, and one for resistance and field control.

The auxiliary equipment consists of two air compressors, two exhausters, one rotary blower, and one motor-generator set, all of which are driven by means of 1,500-volt motors fed from the main supply. Control of these motors is carried out by means of electrically-operated contactors, the control coils being fed at 50 volts from the motor-generator, or the battery, which under normal running conditions floats across the generator terminals. The motor-generator is of special design, being arranged with a separate small exciter and automatic control gear so made that a practically constant generator voltage is obtained with rapid fluctuations of the line voltage between such wide limits as 1,900 and 700 volts.

The air compressors, one of which is sufficient for the normal duty, are used for the air brakes on the locomotive, the air-operated contactors, and other minor operations. An air receiver is employed, and the operation of the compressor motors is controlled by the air pressure in the receiver.

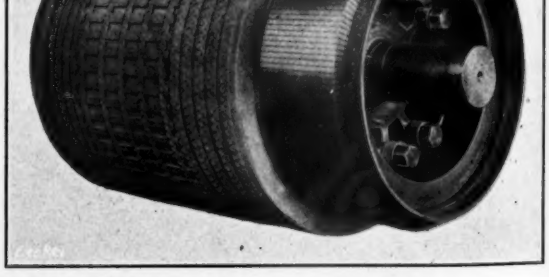


Fig. 7.—Main Motor Armature.

The exhausters are required for the vacuum brakes on the train coaches, and the blower for supplying the ventilating air to the main motors and resistances.

The whole of the resistances, operating switches, and

auxiliary equipment are compactly arranged along the centre of the locomotive above the foot-plate level, leaving a corridor along each side. The high-voltage gear is arranged in two compartments, one at each end of the locomotive, and the auxiliary equipment between these compartments. The resistances and high-voltage compartments are provided with covers so that they are inaccessible while the gear is alive. Protection is provided against overload by means of main fuses and overload relays, and a special no-voltage relay is provided for protection against failure of supply, or interruption of contact between the pantographs and overhead wire. Two pantographs are provided, they being raised and lowered by compressed-air operating gear. Between the pantograph connections and the main switches a lightning arrestor is provided.

Regulations for Overhead Lines.-I.

A Comparison between the Swedish and British Regulations.

By ALFRED EKSTRÖM, D.Sc., M.I.E.E., and VIDAR EKSTRÖM, Civil Engineer.

THE new regulations of the Electricity Commissioners in England for the erection of overhead lines contain less severe restrictions, as compared with those previously in force, and afford improved facilities for the development of rural electrification. As these regulations are of great importance to the industry, it may be of interest to British electrical engineers to learn how they compare with those at present in force in Sweden, more especially in view of the fact that the Swedish climatic conditions vary enormously, from the exceptionally difficult ones prevailing in Norrland to those obtaining in the south of Sweden, which are not very unlike those in England. The Swedish regulations have lately been revised as a result of some twenty years' experience of this subject, but the new rules have not as yet been generally adopted, as they are considered to be too stringent, for instance, for the climatic conditions in the southern parts of the country.

The most important factor in overhead-line construction from the economic point of view is the length of the *span* between the poles. The fewer poles required, the less becomes the expenditure for insulators, supports, &c., and the trouble and difficulty caused by pole wayleaves upon the land traversed, as well as the possibility of disturbance arising from the most delicate and sensitive parts of the lines, namely, the insulators.

It is therefore necessary to determine the effect of the regulations upon the spans, and the resulting circumstances.

Classification of Overhead Lines.

In Sweden the country is divided into different areas according to the climatic conditions of wind, ice and temperature.

The lines are calculated to bear (*a*) a *normal* load, *i.e.*, one due to such conditions of ice, snow and hoar-frost as may be expected to occur every year, and (*b*) an *exceptional* load, namely, one arising from a quite exceptional combination of wind and ice. The normal load varies with the areas, but is the same for all lines within the same area. The exceptional load varies likewise with the climatic areas, but is also made dependent upon the particular purposes of the line. Starting from the load values thus assumed, the lines are calculated on the basis of a common measure of safety for all classes of lines. This method possesses certain advantages in the practical application of the regulations over the alternative method of employing a common load value with varying safety.

The regulations anticipate constructions which, without permanent change in form or shape, can stand a normal load, but which under exceptional conditions will permit of an overload *beyond the limit of elasticity*. We will later revert to this subject.

With respect to their purpose and importance, the lines are divided into the following classes:—

Class i. Trunk Lines.—Lines belonging to the main system for the transmission of power all over the country Usual minimum voltage 110 kV.

Class ii. Larger Provincial Lines.—Lines of considerable importance for the power supply of one or more countries or for some similar purpose. Usual maximum voltage 110 kV.

Class iii. Lesser Provincial Lines.—Lines which in general serve the same purpose as Class ii, but transmit a smaller load, not exceeding 5,000 kVA. Usual maximum voltage 55 kV.

Class iv. Country Lines.—Lines for a fairly large rural district, or large borough, or industrial undertaking, or interconnecting lines for power stations. Usual maximum voltage 44 kV.

Class v. Local Lines.—Lines for a restricted area, for a number of consumers for lighting and power, for smaller industrial works with reserve resources, where an interruption in the supply is not of supreme importance, &c. Usual maximum voltage 11 kV.

In what follows we shall only deal with rural lines falling in Classes iv and v; the latter at a voltage of 400 V/250 V to earth and 3.3 kV; the former at a voltage of 33 kV.

According to the British regulations, overhead lines are divided into two different classes:—

1. Lines at a voltage not exceeding 325 V to earth.
2. Lines at a voltage exceeding 325 V to earth.

Climatic Conditions.

According to the Swedish regulations for overhead lines, control of the tension of the conductors is necessary in the following instances for determining the maximum span:—

A.—The Normal Ice-load Regulation.

1. Temperature 32 deg. Fahrenheit (0 deg. C.).

2. In respect of the occurrence of ice upon the conductors, the country is divided into three areas, G, M and F. The ice-load is calculated at 0.80 lb. (0.4 kg.) within the F area, 1.00 lb. (0.5 kg.) within the M area, and 1.20 lb. (0.6 kg.) within the G area, all per yard (metre) of length of conductor.

3. The wind pressure = 0.

4. The tension of the conductors in this case must not exceed 12.8 tons per sq. inch (20 kg./mm^2), with an estimated modulus of elasticity $E = 14.2 \times 10^6$ lb. per sq. inch (1.0×10^4 kg. per mm^2).

B.—The Exceptional Ice-load Regulation.

1. Temperature 32 deg. Fahrenheit (0 deg. C.).

2. Ice-load for—

(*a*) Local lines (Class v) situated within—

F area, with a radial thickness = 0.59 inch (15 mm.).

M area, with a radial thickness = 0.67 inch (17 mm.).

G area, with a radial thickness = 0.75 inch (19 mm.).

(*b*) Country lines (Class iv) situated within—

F area, with a radial thickness = 0.67 inch (17 mm.).

M area, with a radial thickness = 0.75 inch (19 mm.).

G area, with a radial thickness = 0.83 inch (21 mm.).

The weight of the ice is assumed to be 30.8 lb. per cubic foot (0.5 kg. per dm^3).

3. The wind pressure is estimated—

In the country in general at 63.5 miles per hour (28.3 m. per second), which is assumed to correspond to a tension of 20.4 lb. per sq. foot (100 kg. per m^2).

In the coastal districts (situated within six miles of the sea) at about 25 per cent. more, or 79.5 miles per hour (31.5 m. per second), corresponding to a tension of 25.6 lb. per sq. foot (125 kg. per m^2). The pressure against an ice-coated conductor is estimated to correspond to the wind pressure upon the projection of the actually encountered cylindrical surface, multiplied by a reduction factor of 25 per cent.

4. The tension of the conductors in this case must not exceed 20.3 tons per sq. inch (32 kg. per $mm.^2$). The modulus of elasticity E is assumed to be constant $= 14.2 \times 10^6$ lb. per sq. inch (1.0×10^4 kg. per $mm.^2$) up to a tension of 12.8 tons per sq. inch (20 kg. per $mm.^2$), but is assumed to fall from 14.2×10^6 lb. to 11.2×10^6 lb. per sq. inch (1.0×10^4 kg. to 0.79×10^4 kg. per $mm.^2$) for tensions from 12.8 to 20.3 tons per sq. inch (20 kg. to 32 kg. per $mm.^2$).

The tension of a conductor in this case is the resultant of its own weight q_c, the weight of the ice-load q_i, and

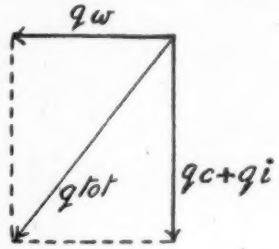


Fig. 1.

the wind-pressure q_w against the entire ice-coated surface, according to fig. 1, where q_{tot} indicates the resultant exceptional load and—

$$q_{tot} = \sqrt{(q_c + q_i)^2 + q_w{}^2}.$$

The additional load q_{wi} of the conductor on account of wind and ice is:

$$q_{wi} = \sqrt{(q_c + q_i)^2 + q_w{}^2} - q_c.$$

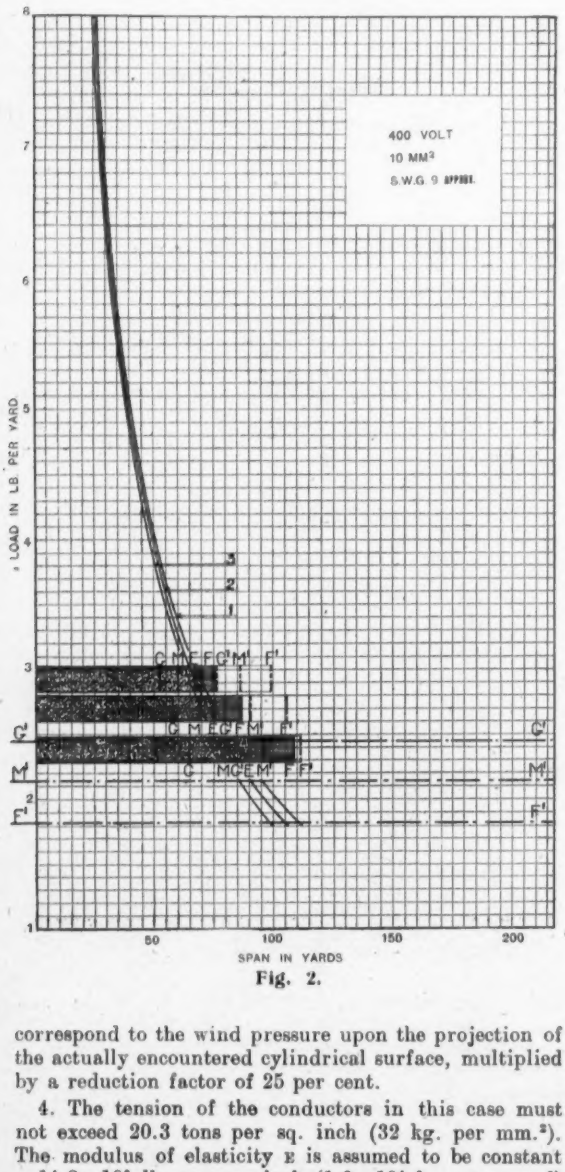


Fig. 2.

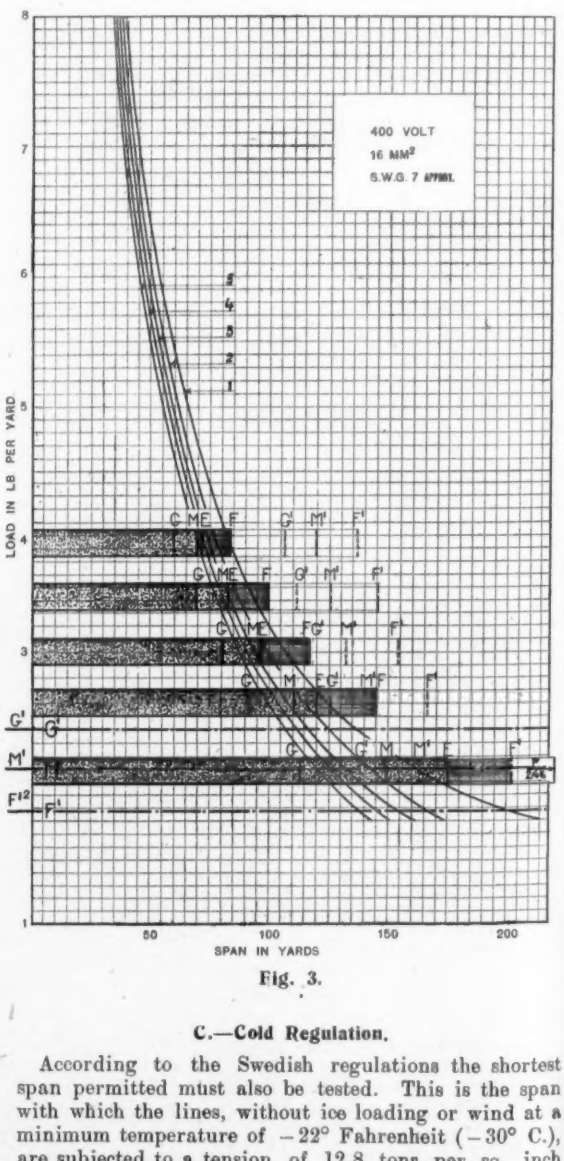


Fig. 3.

C.—Cold Regulation.

According to the Swedish regulations the shortest span permitted must also be tested. This is the span with which the lines, without ice loading or wind at a minimum temperature of −22° Fahrenheit (−30° C.), are subjected to a tension of 12.8 tons per sq. inch (20 kg. per $mm.^2$).

It will, however, be found that the minimum span is almost zero for all regulations with tensions of less than about 9.5 tons per sq. inch (14.9 kg. per mm.²). Higher tensions need not be dealt with here.

Maximum Spans According to British and Swedish Regulations.

The Swedish Regulations.—The additional load according to the Exceptional Ice-load Regulation, as already indicated, is different for different lines, depending upon their geographical situation and purpose (supplying a local-distribution or larger area, province, &c.). Admitting that a conductor is strung to a certain tension, for instance, at 32° Fahrenheit (0° C.) when not exposed to wind and free from ice, there will exist a certain maximum span when the conductor,

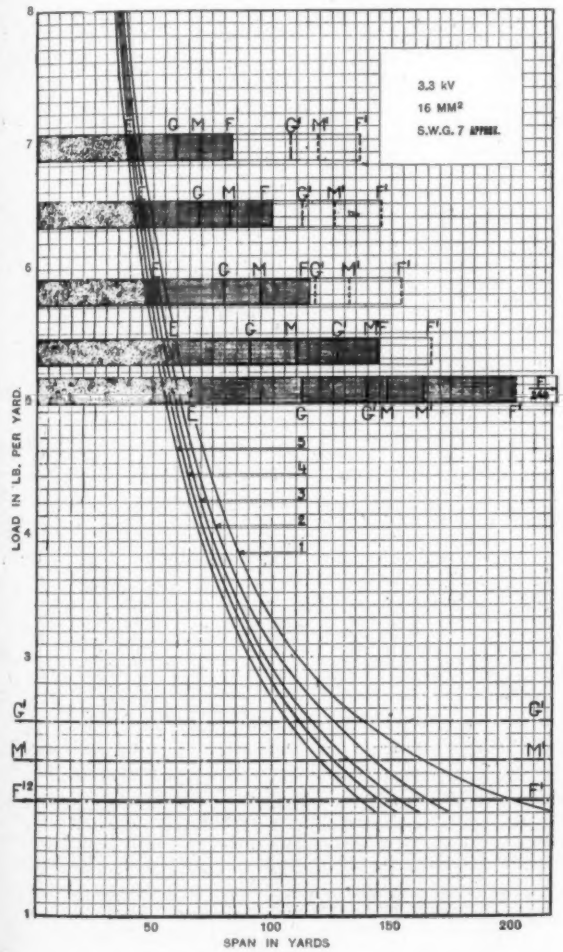


Fig. 4.

on account of this additional load, will obtain a maximum tension of 20.3 tons per sq. inch (32 kg. per mm.²).

Thus, in fig. 2, the curves show the relation between maximum spans and different additional loads for a 10 mm.² (approx. s.w.g. No. 9) overhead line, strung to a tension of 6, 8, and 10 kg. per mm.² (3.75, 5.08, and 6.35 tons per sq. inch) at 32° Fahrenheit (0° C.) with no wind and ice when the maximum permissible tension is 20.3 tons per sq. inch (32 kg. per mm.²).

The curves 1, 2, 3, 4 and 5 in figs. 3, 4 and 5 show in a similar way the relation between the maximum spans and different additional loads for 16 mm.² (approx. s.w.g. No. 7) overhead lines, strung to 6, 8, 10, 12 and 14 kg. per mm.² respectively (3.75, 5.08, 6.35, 7.65, and 8.9 tons per sq. inch), with the same maximum permissible tension of 20.3 tons per sq. inch (32 kg. per mm.²).

These curves have been constructed according to the methods of Prof. C. Heuman in Stockholm. He assumes that a conductor in its position of equilibrium will take the form of a chain-line (catenary) instead of a parabola, as is otherwise generally approximately supposed.

As already mentioned, in our cases the Cold Regulation can be fully eliminated. A control as to the maximum span according to the Normal Ice-load Regulation must, however, be provided, *i.e.*, the maximum span of the conductor which—with an additional load corresponding to this Regulation (which is the same for all classes of lines and only depends on their geographical situation)—will give a maximum permissible tension of 12.8 tons per sq. inch (20 kg. per mm.²), assuming that the conductors have been strung up to a certain tension at 32° Fahr. (0° C.), not exposed to wind and free from ice.

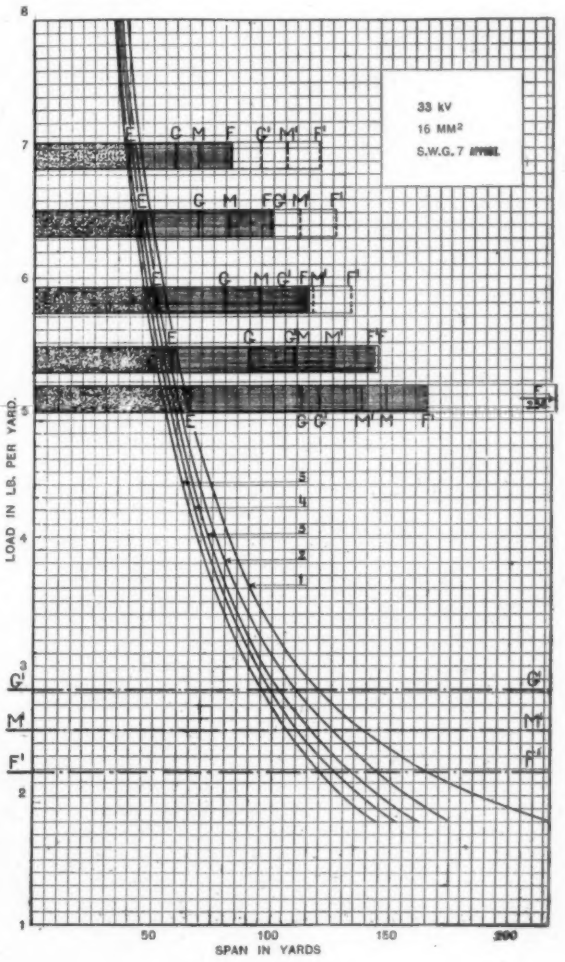


Fig. 5.

The maximum span thus obtained is generally longer than that resulting from the Exceptional Ice-load Regulation, in which case the latter one is valid. In certain cases, however (when the conductors are strung up to a very low tension), the Normal Ice-load Regulation will give a shorter span, in which case this span is valid.

In the accompanying diagrams the spans according to both regulations are marked: F^1, M^1 and G^1 represent maximum spans according to the Exceptional Ice-load Regulation, and F, M and G maximum spans according to the Normal Ice-load Regulation.

The British Regulations assume a wind-pressure of 50 miles per hour (22.3 m. per second), and this wind is considered to exert a pressure equivalent to 8 lb. per sq. ft. (39 kg. per m.²), calculated on the whole of the projected area of the ice-covered line at a temperature of 22° Fahr. (−5.5° C.).

For lines under 325 V to earth a radial ice-covering of 3/16 inch (4.75 mm.) is assumed.

For lines over 325 V to earth, on the other hand, a radial ice-covering of 3/8 inch (9.5 mm.) is assumed.

The weight of the ice is calculated at 57 lb. per cubic foot (0.91 kg. per dm.^{3}).

Thus in England only one control is prescribed, approximately corresponding to the Swedish Exceptional Ice-load Regulation.

The tension of the conductor under the resulting additional load must not amount to more than—

(1) For less than s.w.g. No. 9, 27.4 tons per sq. inch, with a safety factor = 2—thus in reality to 13.7 tons per sq. inch (21.6 kg. per mm.^{2}).

(2) For over s.w.g. No. 9, 27.1 tons per sq. inch, with a safety factor also = 2—thus in reality to 13.55 tons per sq. inch (21.35 kg. per mm.^{2}).

The diagrams also show resulting spans for different tensions according to the British Regulations (E dotted surface).

The table below shows the maximum permissible spans in England and Sweden (Farsa) in the country outside the coastal districts, assuming the conductors to be strung to a tension of 5.08 lb. per sq. inch (8 kg. per mm.^{2}), when not exposed to wind, or ice, and at a temperature of 32° Fahr. (0° C.).

Pressure in volts.	Area of conductor in		Spans in England.		Spans in Sweden.	
	mm^2	S.W.G. approx.	Yd.	Metres.	Yd.	Metres.
400	10	No. 9	75	68	87	79.5
400	16	No. 7	120	109	145	133
3,300	16	No. 7	58	53	145	133
33,000	16	No. 7	58	53	143	131

Comparison Between British and Swedish Regulations.

As will be seen from the foregoing, the greatest difference between the Swedish and British Regulations is in the paragraphs relating to the maximum tension.

The English Regulations prescribe for the lines a safety factor of 2. In the curves referred to a breaking load of 27.1 tons per sq. inch (42.7 kg. per mm.^{2}) has been assumed for a copper line of 16 mm.^{2} (0.025 sq. inch). See British Engineering Standard Specification No. 125—1924. The permissible tension is thus 13.55 tons per sq. inch (21.35 kg. per mm.^{2}).

In the curves referred to, a breaking-load of 27.4 tons per sq. inch (43.2 kg. per mm.^{2}) has been assumed for a copper line of 10 mm.^{2} (0.0155 sq.inch). The permissible tension is thus 13.7 tons per sq. inch (21.6 kg. per mm.^{2}).*

According to the Swedish Regulations, on the other hand, it is considered that with the Normal Ice-load Regulation, *i.e.*, under frequently occurring severe climatic conditions, a maximum tension of about 12.7 tons per sq. inch (20 kg. per mm.^{2}) is permitted, while in the Exceptional Ice-load Regulation, *i.e.*, under *exceptional* severe climatic conditions, a maximum tension of 20.3 tons per sq. inch (32 kg. per mm.^{2}) is allowed, *i.e.*, *about* 50 *per cent. higher than is prescribed in the British Regulations.*

It may be of interest to know that the prescription of such high values of the maximum tension is the result not only of long experience, but also of particularly thorough and extensive tests on the part of a committee which has been at work for several years, and was composed of the late Chief Engineer of the Hemsjo Power Company, S. Velander, Professor Kreuger, of Stockholm, and Professor Gullander, of Gothenburg. We therefore take the liberty of quoting some results of these tests, as follows:—

"It is thus shown very clearly that a pulling tension considerably above the limit of elasticity certainly produces permanent elongation, but at the same time considerably raises the limit of proportionality in the material, besides which the breaking-limit is somewhat increased. The modulus of elasticity is not so greatly affected, but is nevertheless increased to some extent. This effect of extraordinary tension is not only manifested in copper, but also in iron. The fact that copper does not manifest any limit of elasticity until after it has been worked up and drawn cold is quite a well-known fact. On the other hand, these tests have proved what must be regarded as a new discovery, or at least as a fact that has hitherto not been sufficiently observed, *i.e.*, that by such severe treatment the limit of proportionality may be raised from about 18 kg./mm.^{2} (11.5 tons per sq. inch) to about 32 kg./mm.^{2} (20.3 tons per sq. inch).

"An extraordinary pulling-tension therefore undoubtedly *improves* the material to a great extent. The reason for this improvement in quality is perhaps to be found in a molecular metamorphosis of the material, which is produced by forcible stretching, and is of the same nature as, although far more efficient than, that which is obtained by cold treatment.

"The conclusions to be drawn from these results with regard to the construction of electric overhead lines are of the utmost importance. An overhead conductor that has been erected, and which, by a coating of ice and through storm, is subjected to a tension corresponding to 30 to 35 kg./mm.^{2} (18.5 to 22 tons per sq. inch), certainly undergoes permanent elongation, by which the sag is increased and the tension in the case of unchanged load is reduced per running yard. But at the same time the material has become so much improved as to be capable of standing a similar tension again, in which case, however, the permanent elongation becomes considerably less. If, therefore, such an overloaded line has sagged noticeably, it is still quite strong enough to be readjusted to the original sag.

"It follows from this that the conductors of an electric overhead line *can be strung to a tension higher than has hitherto been used*, so that the tension permitted for copper wires may be estimated at 15 to 17 kg./mm.^{2} (9.5 to 10.8 tons per sq. inch) or possibly even more. This will result in at least double safety in fairly ordinary cases of load, and in extreme cases which can only occur a few times in the life time of a line, the tension may without any risk or danger be increased to 32 kg./mm.^{2} (20.3 tons per sq. inch).

"By this higher tension the following advantages are gained:—

"(1) A reduction in the sags of the lines, whereby a lowering of their points of attachment is made possible, or, in other words, the height of the poles can be reduced and a cheaper design of pole thus made available.

"(2) The risk of the lines becoming entangled is reduced, which means *increased safety of the power supply*. This end may be attained also in older lines if certain conductors (generally the higher placed ones) are strung to a higher tension.

"(3) Wires which, through overload with a covering of ice, hoar-frost, &c., have become permanently elongated, may be strung again to their original tension without any deterioration in quality, and consequently without any increased risk of a break occurring."

Summary and Conclusion.

As will be seen from the foregoing, together with figs. 2 and 3, there can scarcely be any objection to the British Regulations for overhead lines with voltages of less than 250 V to earth as regards the maximum permissible spans of the conductors.

However, the Regulations for lines at higher voltages, for instance, of 3.3 to 33 kV (see figs. 4 and 5) are evidently still unsuitable in this respect, and *entail the fact that*, generally speaking, *spans only half as long as those used in Sweden for the corresponding tensions are allowed in England.*

We will in a following article revert to this subject.

We repeat, however, that these conclusions are based upon a comparison with the Regulations which at present are proposed in Sweden, but which are considered too stringent for the climatic conditions of Southern Sweden.

* The new British Regulations do not permit any smaller sectional area than s.w.g. No. 8 (about 11.7 mm^2), but the difference is obviously insignificant.

Imperial Communications.

An Outline of the more Important Features of the Report of the Imperial Wireless and Cable Conference.

By Lt.-Col. CHETWODE CRAWLEY, M.I.E.E.

THE report of the Imperial Wireless and Cable Conference was published on July 27th. It will be recalled that the Conference was appointed in January last to examine the situation which had arisen as a result of the competition of the beam wireless telegraph with the submarine cable services, and to make recommendations with a view to a common policy being adopted by the various Governments concerned. Sir John Gilmore, Secretary of State for Scotland, acted as chairman of the Conference, and Mr. A. M. Samuel, financial secretary of H.M. Treasury, was the other representative of this country. Canada, Australia, New Zealand, South Africa, the Irish Free State, India and the Colonies and Protectorates were all represented. Sir Otto Niemeyer and Sir William McLintoch acted as financial advisers. Representatives of the cable and wireless interests concerned gave evidence before the Conference, and communications were received from the Federation of British Industries, the London Chamber of Commerce, and the Empire Press Union.

In England the beam radio stations are owned and operated by the Government; in Canada by the Canadian Marconi Company under a Government yearly licence; in Australia by Amalgamated Wireless (Australasia), Ltd., in which the Government holds a majority of shares; in South Africa by the Wireless Telegraph Company of South Africa under a Government yearly licence; and in India by the Indian Radio Telegraph Company under a ten years' agreement. The rates charged for telegrams are in all cases under Government control.

The cable interests directly concerned are the Eastern and Associated Telegraph Companies, the Indo-European Telegraph Company, the State-owned Pacific Cable Board's system and the two State-owned transatlantic cables.

The rates for the Anglo-Canadian beam radio service are the same as the cable rates, and for the Australian, South African and Indian services the rates for full-rate traffic are 4d. a word less than the corresponding cable rates; for deferred traffic 2d. less, and for letter and Press telegrams from 3d. to ½d. less.

The traffic transmitted by the beam radio services with Canada, Australia, South Africa and India amounts to 6, 9, 9 and 10½ million words a year, respectively. The rates charged for traffic on these services could be, it is said, substantially reduced and still furnish a handsome return on the capital invested, and the Report states that "the beam services could always afford to undercut the cable rates, and if competition were unrestricted could render the cable systems unremunerative."

The main features of the situation as summed up in the Report are:—

(*a*) The cable undertakings operating between the constituent parts of the British Empire would be unable to continue on a paying basis in face of unrestricted competition on the part of the beam wireless services.

(*b*) The Eastern and Associated Telegraph Companies would be in a position to go into voluntary liquidation and dispose of their assets to the highest bidder.

(*c*) There are indications that foreign enterprise might be ready to seize an opportunity of acquiring such part of the Eastern and Associated Companies' system as could be transferred to a foreign purchaser.

(*d*) Owing to the lack of complete secrecy and certainty, wireless is not yet in a position entirely to supersede cables; cables, therefore, still possess great value for the maintenance of necessary communications between the constituent parts of the Empire for commercial and strategical purposes.

The five possible ways in which this situation might be dealt with are stated in the Report to be non-intervention, subsidy, minimum revenue guarantee, pooling scheme, and fusion.

The first three methods are dismissed as unacceptable, mainly on the grounds that they would involve Government expenditure. Pooling is also not recommended, as it is thought that it would be difficult to ascertain the precise financial prospects of the pools, and a contingent Government guarantee of their solvency on the part of the Governments concerned might arise; moreover, it is thought that it would be impossible to achieve such great economies with a pooling scheme as with complete amalgamation, and that the union of control not being complete would be less free to turn all its resources and energies either to conducting a large public service or to facing external competition from foreign enterprises.

The Conference, therefore, has unanimously recommended a fusion, or merger, scheme to amalgamate so far as is possible in one undertaking all the cable and wireless interests conducting communications between the various parts of the Empire, so as to secure unity of control and unity of direction. It considers that by this means there would be a reasonable prospect of securing reductions in telegraph rates while conserving and improving the communication services of the Empire without entailing contributions from public funds, and that, though the amalgamation would be in the nature of a monopoly, means and measures could be devised which would guarantee to the communities concerned an efficient service at a reasonable cost. The recommendations of the Conference are as follows*:—

(1) A Merger Company to be formed to acquire as from April 1st, 1928, all the ordinary shares of the Eastern, Eastern Extension, and Western Telegraph Companies, and all the ordinary and preference shares and debentures (if any) of the Marconi's Wireless Telegraph Co., Ltd.

(2) A Communications Company to be also formed to which the Cable and Marconi Companies will sell as at April 1st, 1928, all their communication assets in exchange for shares. The Communications Company will, therefore, hold all the communication assets of the Cable and Marconi Companies, except in so far as they belong to the subsidiary companies in which the Cable and Marconi Companies' holdings are less than 100 per cent. The Communications Company will acquire the holdings of the Cable and Marconi Companies in those communications companies in which the Cable and Marconi Companies' holding is less than 100 per cent. The Communications Company will also acquire the Government cables and hold the lease of the Post Office beam radio stations. The capital of the Communications Company not to exceed at its inception £30,000,000.

(3) *Terms of transfer of the Government's cable and radio beam assets.*—The Communications Company to take over as from April 1st, 1928, the Pacific Cable Board's cables, the West Indian cable and wireless system worked by the Pacific Cable Board, the Imperial Atlantic cables and the lease of the Post Office beam services (including provision for the transfer to the Company of existing staffs) on terms to be arranged.

The beam services to be leased for 25 years at a rental of—

(*a*) a basic sum of £250,000 per annum;

* See also ELEC. REV., July 13th, 1928, p. 76

(*b*) as from April 1st, 1931, an addition equivalent to 12 per cent. on any increase in the Company's profits (from communication services) above the standard revenue;

(*c*) a payment of £60,000 to be made in such manner as may be agreed.

The Communications Company to undertake to meet the annual service of the outstanding debt on the Pacific Cable Board as on April 1st, 1928, and to pay in addition a capital sum of £517,000 for the Pacific cables, together with interest at 5 per cent. as from April 1st, 1928; to pay £300,000 for the West Indian cable and £450,000 for the Imperial cables.

The rental payable by the Communications Company and the service of the Pacific Cable Board debt will be guaranteed by the Merger Company.

(4) *Direction and management of the undertakings concerned.*—The Board of Directors of the Merger Company, the Communications Company, the Cable and Marconi Companies will be identical. Two of the directors, one of whom shall be chairman of the Communications Company, to be persons approved by His Majesty's Government on the suggestion of the Cable Companies.

(5) *Revenues of the Communications Company.*—A standard net revenue of £1,865,000 (exclusive of non-telegraph investment revenue) from the Communications Company services to be fixed to the purposes of the Company; all net revenue from communication service in excess of that sum to go as to 50 per cent. to the Company, and as to 50 per cent. to reduction of rates or such other purpose as the Advisory Committee (see recommendation 6) may approve. If additional capital expenditure is incurred by the Communications Company in relation to traffic, there shall be added to the above initial standard revenue an appropriate charge for interest at such rate as may later be agreed.

(6) *Control by the Governments concerned.*—The Communications Company to consult, with regard to questions of policy, including any alteration of rates, an Advisory Committee, which the Conference suggests should include representatives of the Governments participating in this Conference, to whom representatives of other parts of the Empire may be added as required from time to time with the approval of the Governments concerned. No increases of rates prevailing at the date of the formation of the Communications Company are to be made except with the assent of the Advisory Committee.

(7) *Additional safeguards and conditions.*—It is to be agreed: (*a*) that British control of all the Companies must be guaranteed; (*b*) that the Governments may assume control of the cable and wireless systems in time of war or other national emergency; (*c*) that the fighting services are entitled to build and work cable or wireless stations for their own purposes, but not for commercial purposes.

(8) *Telephone services.*—The Post Office in London will reserve the right to conduct the external telephone services of Great Britain, but will agree with the Company the terms on which it will have the right to use the Company's wireless stations, or portions thereof, for telephone purposes.

Apprenticeship and Training.

Results of a Ministry of Labour Inquiry.

THE sixth of a series of seven reports incorporating the results of an inquiry made by the Ministry of Labour in 1925 and 1926 into apprenticeship and training for the skilled occupations has been published. The information contained in these reports was obtained from schedules issued to some 44,000 employers in Great Britain and Northern Ireland and also to the principal trade unions, after consultation respectively with the National Confederation of Employers' Organisations and with the General Council of the Trades Union Congress. Although the report covers other industries, such as shipbuilding, railway work, and a large number of the smaller metal industries, this summary deals only with the engineering section, and more particularly with branches (7) and (13), namely, electrical and mechanical engineering and general engineering.

The opening paragraphs of the report refer to the supreme importance of the engineering industry as a field for industrial training, partly because of its widespread character and the great variety of its products, and partly because it comprises a large number of highly-skilled occupations, to gain proficiency in which demands systematic instruction both in practice and theory.

The proportion of skilled craftsmen to the other workers in industry is not so great as was formerly the case. Much of the work of manufacture hitherto done by skilled workers by hand is now performed by automatic or semi-automatic machines: moreover, the parts thus produced can be assembled by semi-skilled workers. Modern methods of production have therefore tended to the increase of what may be regarded as a new class of operative, namely, the process worker. The report states, however, that for the more skilled occupations which are still the mainstay of the industry, apprenticeship remains the normal method of recruitment. Another important fact is also mentioned, namely, that engineering often constitutes the training ground for men who subsequently find employment in other industries; the sea-going engineer and the maintenance engineer in food, chemical, textile, and other factories are typical examples.

Over 2,500 firms were asked to contribute returns, and of these 2,289 furnished information concerning rather more than half a million workpeople, of whom almost exactly one-tenth were stated to be under some form of apprenticeship or training. Some of the principal results obtained from the inquiry may be summarised as follows:—

The great majority (74.9 per cent.) of boys under a definite system of training were apprentices, the remainder being learners. More than twice as many apprentices were serving under verbal as under written agreements; the proportion varied considerably in the different districts and branches of the industry. From the figures obtained during the inquiry it may be deduced that of all workers under 21 years of age in the industry in Great Britain, about 72,000 (32 per cent.) are apprentices and 25,000 (11 per cent.) are learners. No girl apprentices were included in the returns. The period of apprenticeship was predominantly five years, but periods of seven years and periods of five to seven years, according to the age of the apprentice at commencement, were fairly common; relatively few apprentices served for less than five years. It is estimated that about 99 per cent. of the apprentices would complete their term at the age of 21 years or under. All but about 1 per cent. of apprentices began their apprenticeship proper between the ages of 14 and 16 years, but rather more apprentices began at 16 than at 14 or 15 years; comparatively few boys entered upon their apprenticeship after the age of 16 years. In some shops it was the practice to take boys at 14 years of age or so and to employ them for a period as shop boys, machine boys, store boys, &c., before they commenced a regular apprenticeship. The

tendency was for learners to commence at the earlier age (14 years) and to serve for seven years. Many boys were required to serve a probationary period, generally of about one to three months, before being recognised as apprentices. Some firms which engaged boys at ages under 16 years regarded them as probationers up to that age, when they were apprenticed. Further, after completing their apprenticeship or learnership, the majority of boys were required to serve a period as improvers or "young journeymen" before being recognised as fully-trained craftsmen; this period differed in the various districts and branches of the industry, but it was commonly 12 months, and less frequently 20 or 24 months.

The wages of apprentices and of learners varied considerably in the various districts and branches of the industry. The average wage of apprentices in all occupations was 10s. 7d. per week in the first year and 25s. 8d. per week in the last year, compared with 11s. 1d. and 30s. 9d. per week for learners in the first and last years respectively. Apprentices usually received their training by working with skilled journeymen; in some firms they were under the immediate supervision of the foreman, while a few firms had established "nurseries" in which the apprentices were employed for a period of about six months under the instruction of an "apprentice master," prior to being transferred to a definite department of the factory. Many firms, appreciating the importance of technical training for most of the occupations within the industry, provided special facilities for apprentices to attend technical day or evening classes at appropriate schools and institutions organised mainly by the local education authorities. Some employers made attendance at day or evening classes compulsory by including a provision to this effect in the indenture of apprenticeship.

Of the 2,534 firms from which returns were received, there were 1,573 (62.1 per cent.) which employed apprentices and/or learners. The total number of male workpeople employed by these 1,573 firms was 500,527, of whom 58,647 were apprentices or learners. None of the remaining 961 firms, constituting 37.9 per cent. of the firms covered by the sample, employed either apprentices or learners, but 716 of these firms, with 95,612 workpeople, gave information bearing upon the sources of recruitment and methods of training for the skilled occupations. The aggregate number of male workpeople employed by the 2,289 firms, which supplied information, was 596,139, an average of 260 per firm, the average in firms with apprentices and learners being 318, and in 716 firms with no apprentices or learners 133. Firms employing apprentices and learners had an average of 37 such boys in training.

Practically all the marine engineering firms employed male apprentices, while in electrical and mechanical engineering, motor engineering and tramway and omnibus maintenance only about half the firms trained apprentices. In the electrical and mechanical engineering industries, however, the firms employing no apprentices were generally the smaller ones, the number of workpeople employed by the firms taking apprentices being 47,960, while the number of workpeople employed by firms not taking apprentices was 14,540. Some of the firms which did not take apprentices stated that "skilled workers are easily obtained from other sources," while others explained that the processes of manufacture were sub-divided, and sufficient and suitable process workers were obtained by a system of promotion or up-grading.

The proportion of firms without apprentices was greater in the south of England than in the north, while, generally speaking, the larger firms employed in proportion to their size a smaller number of apprentices than the smaller firms. In firms employing from 500 to 1,000 people, for example, the proportion of workers to apprentices was 12.5 to 1, while in firms employing over 3,000 workpeople the proportion was 18.9 to 1.

Of the 58,647 boys covered by the engineering industry, 23.3 per cent. were apprenticed under indentures or written agreements, 51.6 per cent. were apprenticed under verbal agreements, and 25.1 per cent. were described as learners. These proportions varied considerably in the different trades, indentures being most frequent in the case of draughtsmen, electricians, fitters and erectors, and general engineering apprentices. The payment of premiums for trade apprenticeship appears to have practically died out, but is still frequent among pupil apprentices, that is, those training for the profession of engineering rather than for craftsmanship.

Although the report does not take into account post-apprenticeship records, there is reference to the wastage which results from apprentices entering other industries or failing to continue at their own craft. Ninety per cent. of the apprentices continued as improvers, but it would be interesting to know what proportion of this 90 per cent. continued as craftsmen after their improvership; the experience of many engineering firms is that owing to promotions, and transfers to other industries and similar causes the ultimate wastage among their trainees is considerably greater than 10 per cent.

In the engineering industry, arrangements regarding aprenticeship are made between the individual employer, the apprentice, and his guardian. With few exceptions there are no arrangements between employers and workpeople concerning the conditions of employment of apprentices. Local associations of employers, however, have district scales of wages for apprentices, but the report notes that while the members of the local associations would generally have regard to the recommended rates, they are not under any obligation to do so.

Some important sections of the report deal with special apprenticeship schemes, while others make reference to the selection of apprentices, works schools, prize schemes, and recreational facilities. There are also given as appendices specimen forms of apprenticeship agreements as recommended by the Engineering and Allied Employers' Federation, and a typical scheme of training for apprentices as operated by the British Thomson-Houston Co., Ltd.

It is noteworthy that, apart from such standardisation of conditions of employment as might be expected to result from the use by a number of employers of the Federation form of agreement, the only uniform apprenticeship scheme discovered in the course of this inquiry was that adopted by the Hull Iron Trades Employers' Association. Details of this scheme are given in the report, from which the following salient features are abstracted:—

Apprentices are bound under indenture, the normal period of apprenticeship being from 16 to 21. Boys may be employed as probationers from 14 years of age, but in selecting apprentices preference is given to boys who have entered upon attendance at evening classes immediately upon leaving the day schools. Apprentices are required to attend classes at the Technical College or its affiliated schools, and class fees are refunded by the employer on production of the student's sessional record. There are rewards for successful work at the classes, and in selecting boys for promotion to the drawing office, college and workshop records are taken into consideration. The wages paid range from 9s. per week in the first year to 23s. per week in the fifth year of apprenticeship, but about one-third of this wage is a bonus, which is paid conditionally upon the good conduct and good timekeeping of the apprentice.

Although collective arrangements of the Hull type are by no means of widespread application, the report records that "the industry affords many examples of individual schemes of apprenticeship training adopted by firms to meet their own needs. Many of the principal firms have in operation well-devised and systematic schemes of training for the apprentices in their works." Such schemes as that outlined above and the one set out in the appendix may be regarded as the highest point to which apprenticeship training in the electrical and mechanical engineering industry has attained so far.

Legal.

The Attorney-General v. Birkenhead Corporation.

In the Chancery Division, on July 26th, Mr. Justice Maugham had before him an action brought by the Attorney-General, acting at the relation of Mr. Herbert Halsall, a ratepayer and a member of the Birkenhead Corporation, against the Corporation for declarations that certain resolutions passed by committees and confirmed by the Corporation were unlawful; and that it was unlawful for the Corporation or its servants to act upon them or to require any person as a condition of employment or continuance in employment to become or be a member of a trade union. The Attorney-General also asked for an injunction to restrain the Corporation from acting upon or enforcing the resolutions.

Mr. G. J. Lynskey, for the Attorney-General, said that on June 1st and July 6th last year the Corporation, which had a Socialist majority, confirmed and adopted resolutions of various of its committees that the employés of the committees should be required to become members of certain trade unions. On August 21st, 1927, the Corporation dismissed Arthur E. Stafford, an employé, because he was not a member of the Electrical Trades Union, but allowed him to resume work when he became a member of that union on September 19th. Stafford brought a successful action in the Birkenhead County Court for a declaration that the Corporation, in dismissing him, had acted in contravention of the Trade Disputes and Trades Unions Act, 1927, which made it unlawful after July 29th, 1927, for a corporation to make it a condition of employment that a person should be a member of a trade union. On December 7th last Mr. Halsall moved, at a Corporation meeting, that the committees' resolutions should cease to be operative, but the motion was defeated.

The Corporation, in defence, said that on August 20th, 1927, the district secretary of the Electrical Trades Union threatened Mr. Spencer, the Corporation's electrical engineer, that that union would withdraw its members who were employés of the Corporation unless Stafford, a member of another union, joined the Electrical Trades Union.

Mr. Singleton, K.C., who appeared with Mr. Lynskey for the Attorney-General, said that, notwithstanding what it now said, the Corporation declined to take any steps to make it known to its employés that the resolutions would not be enforced. The hearing was adjourned, and upon its resumption,

Mr. A. E. Stafford, an electrician, said he was engaged by the Corporation Electricity Department, and joined the National Union of Enginemen, Firemen and Electrical Workers. Soon afterwards he was approached by the local secretary of the Electrical Trades Union, and later a messenger from Mr. Spencer, the borough electrical engineer, told him he was dismissed. Mr. Spencer said that the Electricity Committee had decided that only E.T.U. men must be employed. He thereupon joined the E.T.U. and he was re-engaged.

Answering Sir Henry Slesser for the Corporation, Mr. Stafford admitted that until the union officials came to him nobody on behalf of the Corporation said anything about his belonging to a trade union. "But it was put about," he said, "that if you were not a member of a union, you would never get a job."

Mr. Robert Fenton, an electrician, said that on August 18th, 1927, he applied to the Electricity Department for work, and was asked if he belonged to a trade union. He said that he did not, but was willing to join one. The official then replied "I have orders from the chief engineer that only union men must be employed."

For the defence, Sir Henry Slesser said the Corporation had never threatened and did not now threaten to act upon the resolutions. He agreed that if it had done so it would have been unlawful. It admitted that it had now no right to insist upon its employés being trade unionists, though at the time the resolutions were passed there was nothing to prevent its so insisting.

Evidence was given that notices relating to the resolutions were posted in the departments and after the passing of the Act were taken down.

His Lordship, in giving judgment, said the passing of the resolutions and the issue of information to the Corporation's employés regarding them was perfectly legal, and the Act had nothing to do with the object of the Corporation in passing them. The Trade Disputes and Trade Unions Act came into operation shortly afterwards and he was not at all sure that it was obligatory on the Corporation to declare that the resolutions were to be no longer operative. There were, however, significant incidents that instructions were given to the electrical engineer to dismiss Stafford. These general instructions given by the Electricity Committee with regard to the employment of electricians remained unrevoked, and further, it was absolutely wrong, after the passing of the Act, to cause a notice to be posted up in the Tramways Department that the employés there were required to become members of a trade union. The refusal of the Corporation in December, 1927, to instruct heads of departments that they were no longer to insist on trade union membership showed the desire of the Corporation that the resolutions should continue to exercise some influence on the men and the officials engaging them. He was satisfied, however, that there was no desire to oppress people who were not trade unionists or to put into force the resolutions except to a limited extent. Accordingly he did not think it right to grant any injunction to restrain the Corporation from acting on, or enforcing the resolutions. There would, however, be a declaration that it was not lawful for the Corporation to require any person as a condition of employment or continuance in employment to become or be a member of a trade union. The Corporation must pay the costs of the action.

Leicestershire and Warwickshire Electric Power Co. v. the Ministry of Transport.

This case was heard on July 25th by a King's Bench Divisional Court, consisting of the Lord Chief Justice (Lord Hewart), Mr. Justice Acton, and Mr. Justice Branson. A rule *nisi* for a writ of *certiorari* had been obtained by the Leicestershire and Warwickshire Electric Power Co. calling on the Minister of Transport to remove into the High Court a Special Order made by the Electricity Commissioners under the Electricity (Supply) Acts in respect of Polesworth and district. Arguments were heard by the Court on the point whether the order was *ultra vires* and should be quashed. The Polesworth Order authorised the Pooley Hall Colliery Co. to supply electricity to an area included in the Atherstone Order previously granted to the Power Co. The area comprised Tamworth, Baddesley, Ensor Baxterley, Polesworth, and part of Grendon, and the Power Co. contended that the Order granted to it could not be revoked, and that the Minister had no authority to confirm the revocation by the Commissioners of one Special Order by making another Order.

The Solicitor-General (Sir Boyd Merriman, K.C.) said that as the Power Co.'s powers in the area concerned were not sufficiently used, an inquiry was held by the Electricity Commissioners, who then made the Polesworth Order transferring to the area of supply of the Pooley Hall Colliery Co. the places mentioned.

Mr. Tyldesley Jones, K.C., for the Pooley Hall Colliery Co., stated that for four years after the Atherstone Order was made the Power Co. did not lay any distributing mains in the area which, under the Polesworth Order, would be transferred to the Colliery Co.

Mr. Wilfred Green, K.C., for the Power Co., submitted that a company which was granted a Special Order was entitled to retain its powers under the Order until they were taken away by Act of Parliament. The right procedure to get rid of the Order had not been adopted in this case, and the Power Co. was entitled to have the Polesworth Order quashed.

The Lord Chief Justice, giving judgment, said that the question was one of jurisdiction, and the applicants for the rule contended that the Electricity Commissioners had exceeded their jurisdiction. It was apparent that Section 26 of the Electricity (Supply) Act, 1919, did not confer on the Commissioners power to revoke a Special Order, though they had power to revoke a Provisional Order. It was said that the result was grotesque—that Provisional Order, which needed confirmation by Act of Parliament, might be revoked by a Special Order, but a Special Order could not be revoked except by Act of Parliament. "It is quite obvious," continued the Lord Chief Justice, "that this section is a difficult section, and it is deplorable that a matter which could have been made perfectly clear should have been left in any sort of obscurity, especially where the subject matter of the controversy involves such a question as taking away or diminishing acquired rights." If the section intended that any Provisional or Special Order might be revoked, why did it not say so? His Lordship saw no repugnancy between the notion that the Electricity Commissioners had power to revoke antecedent orders and the notion that when they proceeded to their work there must be finality about it, subject to a statute. The Electricity Commissioners in making the Order exceeded their jurisdiction, and the rule would be made absolute.

Mr. Justice Acton and Mr. Justice Branson concurred, and the rule was made absolute with costs in favour of the Power Co. against the Minister of Transport.

Marconi's Wireless Telegraph Co., Ltd., v. Alphian Wireless, Ltd.

In the Chancery Division, on July 25th, Mr. Justice Maugham had before him an action brought by Marconi's Wireless Telegraph Co., Ltd., against Alphian Wireless, Ltd., Mortimer Street, W., to restrain infringement of three letters patent.

Mr. Geoffrey Tookey, for the Marconi Company, said that the action was originally defended, but the defence had been struck out through the defendants' failure to comply with an order for discovery of documents. His clients asked for an injunction to restrain defendants from infringing their patents, an inquiry as to damages and payment by defendants of any sum found due, delivery-up or destruction of infringing articles, and costs.

His LORDSHIP said he had come across a great many cases in which the article could be altered so as to remove any infringement.

Mr. TOOKEY said that these were wireless receiving sets manufactured in such a way that to reconstruct them would mean making a new article. The removal of a part might or might not make the article cease to infringe, but it would not be easy for anybody else to replace that part and the article would then infringe again. It substantially affected the whole apparatus.

The JUDGE said that plaintiffs would have the judgment for which they asked, and the costs of the inquiry would be reserved.

Alleged Infringement of Welding Machine Patent.

MR. JUSTICE EVE, in the Chancery Division, recently heard an action brought by the Rose Street Foundry & Engineering Co., Ltd., Inverness (owners of the A-I Welding Appliances Co., London), against the India Rubber, Gutta Percha & Telegraph Works Co., Ltd. The plaintiffs alleged that the defendants had caused to be altered a manually-operated electric resistance butt-welding machine so that it infringed the plaintiffs' Patent No. 190,734, covering the automatic control of the welding operation.

In his considered judgment, Mr. Justice EVE said that an important factor in the butt-welding process was the speed of approach of the two electrodes during the flashing period prior to the formation of the actual weld, and the speed in the last stage, *i.e.*, the formation of the weld in the butting stage. As the last stage was reached an acceleration of speed was necessary, and prior to the invention in question the relative rates of speed were all controlled by the hand and eye of the operator, which not only necessitated the employment of skilled operators, but made it almost impossible to apply identical conditions to successive pieces of work. The improvement claimed provided means for automatically controlling a pre-arranged speed of approach during both periods and a pre-determined point of increase, thus dispensing with the skilled operator and securing uniformity for repetition work. After considering the nature of the invention, his LORDSHIP said that, in his opinion, the invention was accurately and sufficiently described and illustrated in the specification and drawings, and the utility of the invention had been completely established. It had not only enabled highly-skilled labour to be replaced by comparatively unskilled labour, it had also increased output and reduced rejected welds. The objections founded on prior publication, prior public use, and prior common general knowledge had not been sustained. The infringement could not be doubted, and he would award the plaintiffs the injunction which they claimed, an inquiry as to damages, the delivery-up of the infringing machines, and the costs down to and including that judgment. Subsequent costs would be reserved, with liberty to apply. He also granted a certificate of validity.

Scammell & Nephew v. Members of the Stepney Electricity Committee.

IT will be recalled that damages and costs were awarded against the defendants in this case for their action in cutting off the electricity supply to the plaintiffs' premises during the general strike of 1926. The Stepney Borough Council has now adopted a recommendation of its Finance and Parliamentary Committee that the action taken in reimbursing, from time to time, the expenses already incurred by the defendants in fighting the action be approved. The Committee stated that eminent counsel had supported the view that this course was legal, although no part of the damages and costs awarded by the judge could be paid.

Marconi Patents Application.

As we briefly reported in our last issue, the Brownie Wireless Co. (of Great Britain), Ltd., last week made application to the Comptroller-General of Patents for a compulsory licence under certain Marconi radio patents and for a reduction of the royalty payable to the Marconi Company. It was suggested by Mr. R. Moritz, K.C., for the applications that a better basis for the royalty would be a percentage of the retail price of the set rather than so much per valve-holder, but Mr. WHITEHEAD, K.C., who appeared for the Marconi Co., pointed out that the royalty would then be sometimes charged on an expensive cabinet.

The proposed alteration of basis was supported by Mr. J. BARBER, governing director of the Brownie Co., who said, according to the *Wireless Trader*, that he wished to establish friendly trading relations with the Marconi Co. in the place of the discontent which now existed on account of what the trade considered the unreasonable attitude of the Marconi Co. He claimed to have the moral support of the Radio Manufacturers' Association. He said that as a condition of granting a licence for the manufacture of sets involving Marconi patents, the Marconi Co. insisted that royalties should be paid on all sets produced by the applicants.

Mr. H. A. GILL, patent adviser to the Marconi Co., considered that the percentage method of charging royalties would be unsuccessful. Manufacturers would be tempted to put all parts subject to royalty in one small unit and make up non-patented units for sale free of royalty.

Mr. I. SCHOENBERG, joint general manager of the Marconi Co., expressed the view that the existing royalty of 12s. 6d. per valve-holder was a reasonable one. In reply to Mr. Moritz, he said that he did not know that the rate of royalty in France was only about 10d. per valve-holder, and in Germany about 1s. 6d. He maintained that it was impossible for his company to distinguish what part of a manufacturer's output involved its patents from that part which did not and that was why the royalty was charged on all sets. It would be higher if it was applied only to the sets which employed Marconi patents. Questioned by Mr. Moritz, the witness agreed that there were no written licences in existence between his company and what were described as the "Big Six" radio manufacturing companies. Some of the licences had lapsed and negotiations for their renewal were proceeding. He also agreed that the General Electric Co., Ltd., had not paid the company any royalty since its licence lapsed and had continued to manufacture a large amount of parts royalty free. To his knowledge, however, that was not the case with the rest of the "Big Six."

Upon the resumption of the case on July 26th, Mr. WHITEHEAD submitted that there was not the slightest evidence that the applicants' business had been prejudiced by the Marconi Co.'s monopoly. There was no guarantee that the price of sets to the public would be lowered if the royalties were reduced. The Radio Manufacturers' Association's principal objects were the keeping down of royalties and the maintenance of prices.

Mr. TREVOR WATSON said that the value of the suggestion that the royalties were strangling the trade could be judged by the growth of the broadcasting industry, concurrently with the reduction in the price of apparatus. As regarded the suggestion that the royalty was beyond the pockets of poor people, it was evident that almost everyone was able to afford a set of some kind.

The COMPTROLLER-GENERAL asked if the applicants could give a guarantee that, if royalties were reduced, the prices of the sets would be lowered and there would be an increased sale. Mr. MORITZ said that if the royalty was reduced they could combine with the Marconi Co. and put it in a position to stop the home constructor who evaded the payment of royalties.

This concluded the hearing, and judgment was reserved for a week. The COMPTROLLER-GENERAL expressed the hope that in the meantime the parties would arrive at an agreement.

On July 27th the Comptroller-General heard an application by the Loewe Radio Co., for a licence to make and sell in this country a new radio receiving set, involving the use of Marconi patents. The Hon. Stafford Cripps, K.C., presenting the applicants' case, said that the set in question was being retailed in Germany at 39s. 6d., and over half a million were sold in that country last year. If a reasonable royalty were applied to the set in this country, a large number of people could become users of a valve set. The German company was willing to transfer the whole of the manufacturing for the British market to this company, and already had a factory at Tottenham which could commence making the set immediately a licence was granted and a large number of people would be employed.

Mr. DAVID LOEWE, a director of the company, said that with a 10 per cent. royalty they could sell the set at 30s. at first and hoped to reduce it to 25s. later.

Mr. J. WHITEHEAD, K.C., who again represented the Marconi Company, asked whether it would not be unjust to other licensees if, because the valves happened to be in one casing in the Loewe set, they only charged royalty on one valve.

The ASSISTANT-COMPTROLLER suggested that if a reduction of royalties enabled the company to sell the sets in large numbers the Marconi Co. would recoup itself for the losses on sets made by non-royalty-paying home constructors.

Mr. WHITEHEAD admitted that that might be the case, but there was no evidence to prove it.

The COMPTROLLER again reserved his decision for a week, subject to no agreement being reached between the parties.

A Workman's Compensation Claim.

BEFORE Judge Shewell Cooper, in the Mayor's and City of London Court, recently, Mr. John Clark, a printer's assistant, claimed £500 damages against the Globe Rotary Press, Ltd., for personal injuries received while in the company's employ. The action was brought under the Employers' Liability Act, 1880, and the plaintiff alleged that injuries to his left hand were due to a defect in the electrical starting apparatus fitted to a rotary printing machine. His hand was caught in the rollers of the machine, and defendant said that this would not have occurred if the "inching" motion had been in order. As it was out of order the machine had to be turned over by using the starting resistance, which made the machine plunge. For the company it was admitted that the "inching" arrangement had been out of order, but it was repaired some time before the date of the accident, and no further complaint had been received. His Honour decided the case in the company's favour, but, with the concurrence of both parties, he dealt with it under the Workmen's Compensation Act, and awarded the plaintiff £1 10s. a week, ordering him to pay the defendants' costs.

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations and Failures.

The Marking of Imported Wireless Apparatus.

The Board of Trade has referred to the Standing Committee under the Merchandise Marks Act, 1926, an application for an Order-in-Council requiring the marking with an indication of origin of imported wireless receiving sets and components. The date of the public inquiry will be announced later, and communications regarding it should be addressed to the Secretary, Mr. E. W. Reardon, Board of Trade, Great George Street, S.W.1, not later than August 24th.

Argentine Labour Troubles.

The Buenos Aires correspondent of *The Times* reported on July 25th that the labour situation in Rosario was chaotic. Tramway and telephone services were stopped and other services were prejudiced.

New Catalogues and Lists.

The T.B.T. Co., Ltd., Bridge Chambers, 171, Queen Victoria Street, E.C.4.—Illustrated lists dealing with transformers, d.c. and a.c. motors, battery-charging sets, &c.

Messrs. Ferranti, Ltd., Hollinwood, Lancs.—Leaflet W6409, illustrating and describing the company's trickle charger.

Messrs. H. & C. Davis & Co., Ltd., 1, The Pavement, Clapham Common, S.W.4.—A net trade pocket price list of house equipment and materials.

British Insulated Cables, Ltd., Prescot, Lancs.—Catalogue P.239, containing full particulars of the company's paper-insulated cables. (Superseding P.207.)

The Marconiphone Co., Ltd., 210-212, Tottenham Court Road, W.1.—Publication No. 508, an illustrated folder describing the company's "Model 53" five-valve portable receiving set. Priced.

W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.—A net trade price list of "Vicma" and "Vinazo" rubber-insulated wires and cables.

Siemens Electric Lamps & Supplies, Ltd., 38-39, Upper Thames Street, E.C.4.—Catalogue No. Z.125, containing illustrated and priced particulars of "Zed" safety fuses and fittings of many kinds, including overhead line protection, distribution boards, watertight fuse boxes, &c.

Recent Contracts.

The Metropolitan Railway Company has placed with the Metropolitan-Vickers Electrical Co., Ltd., a contract covering the supply of 30 completely-equipped motor coaches, together with a number of driving trailer equipments. The new stock is for the improvement of the company's electrified system, particularly the underground section and the Harrow line. The equipment of each coach will include four 275-h.p. motors, axle-mounted and driving through spur gears. The control gear will be of the electro-penumatic unit-switch type, arranged for automatic acceleration. A special feature of the arrangement developed by the Metropolitan-Vickers Co., in conjunction with the designer of the coaches, Mr. C. Hally, the chief mechanical engineer of the Metropolitan Railway, is that the whole of the control equipment will be mounted in a special compartment in the body of the coach, facilitating maintenance and inspection work. With a seven-car train, which has two motor coaches, it is possible to isolate two motors and make any desired adjustments while the train is actually in service without departing from the schedule. The whole of the electrical equipment, including the lighting and heating apparatus, will be manufactured by the Metropolitan-Vickers Company, which has placed sub-contracts with the Birmingham Railway Carriage and Wagon Co., Ltd., for the coaches, and with the Westinghouse Brake & Saxby Signal Co., Ltd., for the air-braking equipment and compressors. The contract follows upon a number of previous important contracts carried out by the Metropolitan-Vickers Co., for this railway, and is the third for equipment of this particular type.

Messrs. Burns-Laird, Ltd., have placed with Alex. Chaplin, Ltd., cranemakers, Govan, a contract for several electric transporter cranes for their new sheds at Broomielaw, Glasgow.

The Equipment & Engineering Co., Ltd., has, during the last few months, received orders from the following undertakings, for its special apparatus for detecting cracks in steel axles, &c.: South African Railways and Harbours; Buenos Aires Great Southern Railway Co.; Japanese Government Railway; Eastern Bengal Railway; and the New Zealand Government.

Motor Speedways, Ltd. has placed an order for a Graham Amplion "Public Address" system to be installed at the Lea Bridge Speedway through Messrs. J. J. Eastick & Sons. The telephone installation, &c., will be installed by Messrs. Harmer and Symmons, 239, Hoe Street, Walthamstow, who will be in charge of the apparatus.

Manchester and Swiss Meters.

The British Electrical and Allied Manufacturers' Association has entered a protest against the decision of the Manchester Corporation to place orders for electricity meters with Swiss firms. Attention is drawn to the disparity between wages paid in the Swiss meter industry and the British rates, and it is maintained that it is an attempt to drive down British wages to a Continental level, and at the same time will injure the goodwill and reputation of local meter manufacturers. Ald. Dagnall, chairman of the Manchester Electricity Committee, has stated in reply that the lowest British tender was received from a London firm, and that tender was accepted for a large part of the contract. The B.E.A.M.A. had stated that the tender of a Manchester firm was only 10 per cent. higher than the Swiss tenders; in point of fact it was 45 per cent. higher. Dealing with this statement, the B.E.A.M.A. replied that if this was the case the Swiss tender must have been submitted at a "dumping" price because the difference between the standard British and Swiss prices of this class of meter is only 25 per cent.

The Leipzig Autumn Fair.

We have received, as usual, particulars of this Fair from the London office, 1, Gower Street, W.C.1. Ten thousand firms will be represented at the show, which runs from August 26th to September 1st. Among these are 310 showing electrotechnical products, 130 radio goods, 200 lighting appliances, as well as many others with displays including items of electrical interest.

A Swiss Electromedical Exhibition.

It is proposed to hold an electromedical exhibition in Lausanne in September next. Artificial sunlight, X-ray and other scientific apparatus by manufacturers of all countries will be shown.

The Liége International Exhibition.

The international exhibition which is to be held in Liége in 1930, will include a large Palace of Electricity for the accommodation of the electrical exhibits. The building will be 688 ft. in length and 196 ft. in width. The main hall will have a gallery.

A New Belgian Trust.

It is stated that the Union Financière d'Electricité et de Transports is to be formed next month with a share capital of 270,000,000 fr. The trust proposes to absorb the Tramways de Rotterdam, the Chemins de Fer Vicinaux Belges, the Tramways Electriques de Sofia, the Electricité et Hydraulique, the Gaz et Cokeries de Liége and the Trust Auxiliaire de l'Industrie. The last two undertakings have holdings in transport and supply works, while the Electricité et Hydrauliques holds a large number of shares in the Ateliers de Constructions Electriques de Charleroi.

Book Notices.

"Broadcast English"—I, Recommendations to announcers regarding certain words of doubtful pronunciation. Pp. 32. London: British Broadcasting Corporation.

"Studies in Magnets and Magnetism," by R. Wild. Pp. 70; illustrated. London: A. H. Stockwell, Ltd. Price 2s. 6d. net.

"Science Abstracts A and B." Vol. XXXI. Part 7. July 25th, 1928. London: E. & F. N. Spon, Ltd. Price 3s. each.

New French Companies.

A company has been formed in Paris (5, Avenue du Coq) with a capital of five million francs and the title La Société de l'Union Electrique du Littoral Méditerranean, to develop electric power supply undertakings on the Riviera.

La Société la Téléphone Française is the name of a new company which has been formed in Paris (40, Rue Louis Blanc), with a capital of 200,000 fr. to manufacture and install telephones.

Bankruptcy Proceedings.

W. WORSNIP, wireless accessories dealer, formerly of 36, Market Hall, Walham Green, S.W.—The first meeting of creditors was held last week at the London Bankruptcy Court, when it was stated that the liabilities amounted to about £300. In the absence of assets the case was left in the hands of the Official Receiver. In his preliminary examination the debtor stated that from December, 1923, until the following April he managed a wireless accessories dealer's business carried on at Walham Green. He received no salary, but was handed 50 per cent. of the profits. In May, 1924, he took a quarterly tenancy of 36, Market Hall, and, with a borrowed capital of £50, began business on his own account as a retailer of wireless accessories. He had always experienced difficulty in meeting his accounts as they fell due. In March last he received notice to quit from the landlord, and he then ascertained that he was no longer able to continue trading, and sold his stock, together with the fixtures, to the present tenant for £120. The debtor attributes his failure to bad trade, ill-health, lack of capital, and losses in connection with a drapery business.

C. S. HILL, electrical factor, trading as Sanderson, Hill and Co., Waltham Street, Hull.—The public examination herein was closed at the Guildhall, Hull, recently. The liabilities amounted to £2,139 against assets of £862. Debtor attributed his failure to the coal dispute, general depression of trade and losses due to bad debts. Until February, 1925, debtor was in business with his father. He commenced on his own account in 1926 with £400 capital. His losses in three years amounted to £929.

J. LITTLER, electrical and radio engineer, 5, Lansdowne Road, and 9, Hoghton Street, Southport.—Receiving order made July 19th, on a creditor's petition. First meeting held August 2nd; public examination October 2nd, at the Court House, Liverpool.

E. D. JONES, electrical engineer, Royal Sportsman Hotel, Portmadoc.—First meeting August 3rd, at the Official Receiver's office, St. Peter's Churchyard, The Cross, Chester. Public examination, September 28th, at the Court House, Portmadoc.

N. JAWETT, electric lamp dealer, 58, Bedford Street, E.—Receiving order made July 25th, on a creditor's petition.

J. A. DAVIES, electrical contractor, Eureka, Church Street, Blaenau Festiniog.—Receiving order made July 24th, on debtor's own petition.

W. BARRACLOUGH, wireless dealer, &c., 45, Owston Road, Carcroft, Doncaster.—Receiving order made July 23rd, on debtor's own petition.

P. FORD, electrical contractor, 4a, Macdonald's Lane, Corporation Street, Manchester.—Bankrupt's discharge suspended until October 25th, 1928.

G. R. SIMS, motor and electrical engineer, Hartlepool Street, Thornley, Durham.—Trustee, Mr. W. A. Ellis, Official Receiver, 14, John Street, Sunderland, released July 20th.

R. HILTON, electrical engineer, 81, Blackburn Street, Radcliffe, Lancs.—Last day for proofs for dividend, August 10th. Trustee, Mr. S. A. Mayers, 16, Silverwell Street, Bolton.

P. W. WITHAM, electrical engineer, 139, Bournemouth Road, Parkstone.—First and final dividend of 4s. 3d. in the £, payable August 4th, at 102, High Street, Poole.

C. S. HILL (Sanderson Hill & Co.), electrical factor, Waltham Chambers, Waltham Street, Kingston-upon-Hull.—Trustee, Mr. W. B. Hall, National Provincial Bank Chambers, Silver Street, Hull, appointed July 19th.

R. V. G. SELLERS (Wireless Supplies and Installations), wireless engineer, Town Hall Buildings, Banbury. Trustee, Mr G. Mallom, Official Receiver, 37, Cornmarket Street, Oxford, released July 17th.

W. HANNA, wireless dealer, 13, Carey Street, Burnley.—Trustee, Mr. H. Parker, Official Receiver, 9, Cannon Street, Preston, released July 17th.

J. WILSON, electrical engineer, 70, Ebrington Street, Plymouth.—Trustee, Mr. A. N. F. Goodman, 11, St. Aubyn Street, Plymouth, released July 17th.

S. E. JONES and G. W. A. E. SHORT (Jones & Co.), dry battery manufacturers, Elsecar, near Barnsley.—Last day for proofs for dividend, August 8th. Trustee, Mr. B. S. Briggs, County Chambers, King Street, Wakefield.

C. F. LINDOP (C. F. Lindop & Co.), electrician, 62, Dale Street, Liverpool.—Last day for proofs for dividend, August 8th. Trustee, Mr. J. Allcorn, Official Receiver, Government Buildings, Victoria Street, Liverpool.

S. SMITH, electrical engineer, &c. (Smith & Sons), 22a, 24 and 26, Victoria Square, Widnes.—Last day for proofs for dividend, August 8th. Trustee, Mr. J. Allcorn, Official Receiver, Government Buildings, Victoria Street, Liverpool.

R. H. NICHOLSON (W. Nicholson), decorator and electrician, 8a, High Street, Mexborough.—Last day for proofs for dividend, August 8th. Trustee, Mr. L. J. Clegg, 14, Figtree Lane, Sheffield.

S. S. KELLY, electrical contractor, 59, North Road, Durham.—Receiving order made July 19th, on a creditor's petition. First meeting, August 3rd, at the Official Receiver's offices, 14, John Street, Sunderland. Public examination, August 21st, at the County Court offices, Durham.

Company Liquidation.

QUICKFIX ELECTRICAL FITTINGS CO., LTD.—First dividend of 2s 6d. in the £, payable on July 27th, at the offices of the liquidator, Mr. P. G. Ritchie, 38, Bath Street, Glasgow.

Private Arrangements.

J. TAYLOR, electrical engineer and wireless factor, 87, Church Road, Willesden, N.W.10.—A meeting of the creditors of the above was held on July 25th. Messrs. Percy Phillips & Co., 132, Great Portland Street, W., submitted a statement of affairs which showed liabilities of £383 and net assets of £47, leaving a deficiency of £336. Mr. Phillips stated that the debtor commenced trading in October, 1924, with a capital of £400. There had been a steady turnover each year, and sufficient net profits had been earned to meet the business and personal expenses. On July 17th last a fire broke out, and stock to the approximate value of £500, together with the fixtures, &c., was destroyed or damaged. The premium on the insurance policy, which fell due in March, had not been paid, and the underwriters had repudiated liability. As a result of the fire the debtor had been left practically without any assets. The latter had been valued in the statement of affairs at what they were worth in the event of the business being continued; they would produce only a very small amount if a forced realisation took place. The debtor possessed no private assets. He had a friend who was willing to help him, and he desired to continue the business. The offer to be submitted was a composition of 3s. in the £, payable as to 1s. in cash, 1s. in three months, and 1s. in six months. The debtor would pay 20s. in the £ if the business was able to stand it in the future. The composition would be secured, and if the offer was not accepted, the stock would have to be sold as salvage. The lease was not thought to be of any value. The sales had been from £2,500 to £3,000 per annum, part of which was wholesale. On the latter the gross profit was from 7½ per cent. to 10 per cent. The profit on the retail turnover was higher. It was suggested that he should submit a cash composition, and an offer of 2s. 6d. in the £, payable in cash, was accepted. The following are creditors:—

	£		£
Brandes, Ltd.	70	Johnson Talking Machine Co.	23
Selector, Ltd.	30	Faudels, Ltd.	29
Vee Cee Dry Cell Co. ...	26		

CATCHPOLE & CO., 25, Eccleston St., S.W.1., electrical engineers, &c.—A meeting of creditors was held on July 24th at Winchester House, E.C.; Mr. P. Houston, of the British Traders' Association, occupied the chair. Mr. R. P. Opass, Coventry House, South Place, Moorgate, E.C., submitted a statement of affairs which disclosed ranking liabilities of £1,558, of which £1,452 was due to the trade, and £106 to the bank. The net assets were £485, leaving a deficiency of £1,073. A creditor had levied execution for £75, and would probably have to be paid in full, together with the Sheriff's charges. A deed of assignment had already been executed, which had prevented a second creditor from levying. Other creditors had commenced proceedings. The debtors were father and son, and he understood that they did not possess any private assets. An offer had been made of £500 for the whole of the assets, and that day a second offer had been put forward of £750.

The trustee under the deed explained that stock of the value of about £270 had been warehoused on the premises for about two years, by the agent of a German firm. He had not considered whether, in the event of bankruptcy taking place, it could be held that that stock was a portion of the debtors' assets. Trading figures for the 13 months to May 31st last, showed that the son's capital account was overdrawn to the extent of £800, whilst the father's was in credit by £400. During the period the sales were £5,971, whilst in the previous year they had totalled £10,676. The falling-off in the turnover was attributed to lack of capital. It was decided that, subject to the execution creditor withdrawing, the matter should be dealt with under the deed of assignment already executed, Mr. W. A. J. Osborne, of Messrs. Corfield & Cripwell, Balfour House, Finsbury Pavement, E.C., being appointed to act as joint trustee together with a committee consisting of Mr. C. Latham, and the representatives of Eversure Accessories, Ltd., Kersons Manufacturing Co., Ltd., the Vulcan Electric & Mechanical Co., Ltd., and W. Geipel, Ltd.

The following are creditors:—

	£		£
Anglin & Co.	24	Kersons Manufacturing Co., Ltd.	90
Barrett, Wakefield & Co., Ltd.	81	Pennant Manufacturing Co., Ltd.	91
Blackwell & Co.	27	Reeves & Co.	35
Electric Cables, Ltd. ...	21	Vulcan Electric & Mechanical Co.	350
Eversure Accessories, Ltd.	84	Wyncoth & Son, Ltd ...	31
Geipel, Wm., Ltd. ...	135	Ziemmerman, P., & Co.	23
Gisbornes, Ltd.	75		

O. C. LAY, trading as the Home Wireless Installation Co., Wandsworth High Street, S.W.—A meeting of the creditors of the above was held recently. Mr. L. C. Stewart, Avenue Chambers, Southampton Row, W.C., submitted a statement of affairs showing liabilities of £510, all due to the trade.

There were net assets of £45. Mr. Stewart said that the debtor commenced trading in April, 1922, with a capital of £75, of which £50 was borrowed; he had since repaid £40. The debtor had borrowed other amounts, but the creditors were willing to stand aside. The debtor also possessed a life policy, of which the surrender value was £15, and he had household furniture estimated to realise £20. The present position had been brought about by the steady falling off in the wireless trade for some months. The debtor had also suffered through the depreciation in the value of his stock and bad debts. The sales had been as follows: 1924, £1,017; 1925, £1,434; 1926, £1,617; 1927, £1,820; and 1928 to date, £705. The deficiency had arisen during the last 15 months. The drawings had been at the rate of £3 10s. a week. An offer had been received to purchase the business for a sum which would be sufficient to pay a composition of 2s. 6d. in the £. An execution had been levied, but the bailiff had been withdrawn on the understanding that the creditors concerned would have the right of re-entry if the composition offered was not accepted. The meeting broke up without any definite resolution being passed. The following are creditors:—

	£		£
Brown Bros., Ltd.	... 21	Portable Electrical Co.	... 22
Dew, A. J., & Co.	...117	Sun Electrical Co., Ltd.	61
Enterprise Mfg. Co.	... 26	Philips Lamps, Ltd.	... 25
General Electric Co., Ltd.	57	Couchman, A. J.	... 23
Martinson & Co.	... 32	Bingham, L.	... 21

Dissolutions of Partnership.

Gilbert & Co., electrical and mechanical engineers, 1a, Beaufort Arches, North Dock, Swansea.—Mr. R. J. Hapgood, R. M. Hapgood, and C. T. Gilbert have dissolved partnership. Messrs. R. M. Hapgood and C. T. Gilbert will attend to debts.

Messrs. H. V. D. and E. M. Read, electrical engineers, Ashurst Works, Dunstable Road, Luton, have dissolved partnership.

Trade Announcements.

Messrs. J. Briggs Electrical Contractors, Ltd., have removed to 9, Store Street, W.C.1, and ask for catalogues in duplicate for the new offices.

The offices and stores of the Enterprise Manufacturing Co., Ltd., will be removed as from August 6th to Electric House, 83-87, Merton Road, Wimbledon, S.W.19. (Telephone: Wimbledon 5475; telegrams: "Asrobemco, Phone, London.")

Radiovisor, Ltd., 26, Church Street, W., has been taken over by Radiovisor Parent, Ltd., 26, Coventry Street, W.

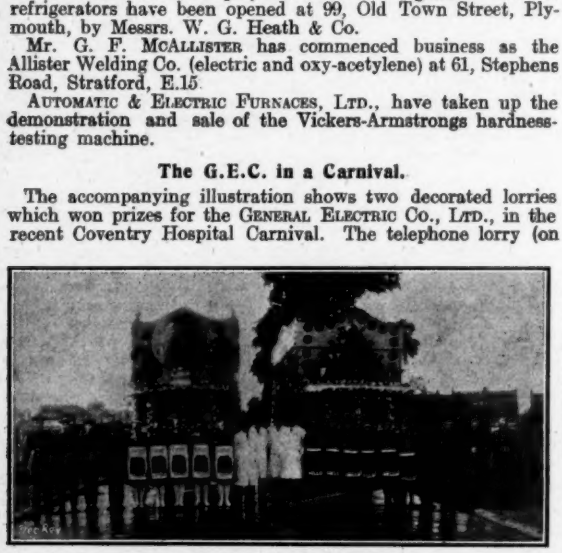
Showrooms for the display and sale of "Frigidaire" electric refrigerators have been opened at 99, Old Town Street, Plymouth, by Messrs. W. G. Heath & Co.

Mr. G. F. McAllister has commenced business as the Allister Welding Co. (electric and oxy-acetylene) at 61, Stephens Road, Stratford, E.15.

Automatic & Electric Furnaces, Ltd., have taken up the demonstration and sale of the Vickers-Armstrongs hardness-testing machine.

The G.E.C. in a Carnival.

The accompanying illustration shows two decorated lorries which won prizes for the General Electric Co., Ltd., in the recent Coventry Hospital Carnival. The telephone lorry (on



G.E.C. Tableaux at Coventry.

the right) represented the flourishing local industry, carried on at the Peel-Conner works; the other symbolised the Company's radio apparatus. The staffs of the lorries were clad in appropriate costumes.

A German Amalgamation.

An amalgamation of interests has recently taken place between the Robert Bosch Geselischaft, Stuttgart, and the Mea Gesellschaft, Feuerbach, two concerns devoted to the production of magnetos and electric lighting and starting sets for motor vehicles.

French Radio Exhibition.

The annual French Radio Exhibition is to be held in the Grand Palais, Paris, from October 25th to November 4th next as part of the Motor Cycle and Cycle Show. The exhibitors will be limited to members of the Sydicat Professionel des Industries Radioélectriques.

New Zealand's Electrical Imports.

During the first quarter of the current year the imports of electrical machinery, appliances and equipment into New Zealand were valued at £542,166, and thus again occupied the first place among the various groups of the import list. The principal suppliers were:—United Kingdom, £300,617; United States, £115,861; Canada, £33,881; and Australia, £10,072.

For Sale.

The Electricity Co. of Macclesfield, Ltd., has for disposal surplus generating plant, battery panels, circuit breakers, &c. Mr. J. R. Spooner, liquidator of Messrs. Hackett & Co., of Southport, invites offers for the stock-in-trade, consisting of electrical goods, lamps, kelvinators, dynamos, cables, &c. (See our advertisement pages to-day.)

Annual Holidays.

The Jackson Electric Stove Co., Ltd., states that its works will be closed from to-day (Friday) until Monday, August 13th, for the annual holiday.

The works of Omega Lampworks, Ltd., will be closed from August 4th to 11th inclusive.

Messrs. Newtons of Taunton state that their works will be closed from August 3rd until August 13th, inclusive; a small staff will be available to deal with urgent business.

Unemployment.

There was a further increase (4,970) in the number of registered unemployed during the week ended July 16th. At that date the total was 1,247,400, as compared with 1,242,430 on July 9th, and with 1,047,960 on July 18th, 1927.

Prices of Raw Materials.

Messrs. F. Smith & Co. report, July 31st:—No change in the price of electrolytic copper.

Messrs. James & Shakespeare report, July 31st:—Copper bars (best selected), sheet and rod, no change; English pig lead, £22 5s., 5s. inc.

Messrs. Edward Till & Co. report, July 31st:—No change in the price of india-rubber Para fine.

Messrs. James Forster & Co., reporting on July 28th said:—"The lead market has been very quiet this week, but with light arrivals and continued support from leading dealers the tone has kept firm, particularly in the near position. The turnover was small. The price in the United States is unchanged at 6.20 cents. Demand from consumers is still very moderate and is confined chiefly to purchasers for early delivery, and it seems probable that the same conditions will prevail next month. Arrivals, on the other hand, from all accounts, will be quite sufficient for current requirements. The recent firmness in London has been due more to a better Continental demand than to any increase in activity in this country.

Lighting and Power Notes.

Beckenham.—Loan Sanctioned.—The Urban District Council has received sanction to a loan of £4,500 for the conversion of public lamps from gas to electric lighting.

Belgian Congo.—Hydro-Electric Development.—Some additional particulars are now available of the hydro-electric plant which is being established by the Société Générale des Forces Hydro-Electriques du Katanga to utilise the Lufira falls in the Belgian Congo. A dam 1,140 ft. in length, is to be established at Madingusha, from which an open channel about 2,180 ft. in length, and three penstocks, approximately 1,000 ft. long will convey the water to the power station. The latter which will work under a net head of 360 ft., will at first be equipped with three 12,000-kVA turbo-generators and three transformers. Electricity will be generated at 6,000 V and stepped up to 120,000 V, at which pressure it will be transmitted to Panda, a distance of 44 miles, where the pressure will be reduced to 6,600 V. Good progress has been made with the preliminary operations.

Brighton.—Electricity Extensions.—The Electricity Committee has submitted to the Town Council an estimate of the ultimate cost of the present extensions of buildings and plant at the Southwick power station. The grand totals of the various sections are as follows:—Buildings, £39,290; boiler section, £49,344; steam pipe section, £9,700; turbo-generator section, £68,576. The *Brighton Evening Argus* reports that the Council has sanctioned £156,010, and is now asked to sanction the balance of £10,900, and to allow an extra £1,000 for contingencies. Mr. J. Christie, the electrical engineer, reports that additional expenditure amounting to £59,776 will also have to be incurred for e.h.p. switchgear, buildings, and cable con-

nections, at Southwick; and £50,000 for an additional scheme for supplementing the condensing water system. Other expenditure which will have to be contemplated comprises the following:—North-road extensions, £124,500; new sub-stations, £15,500; floating loan for various purposes, £50,000.

Canada.—ELECTRICAL DEVELOPMENT.—A report by the Water Power and Reclamation Service, of the Canadian Department of the Interior states that during this year plant with a capacity of 550,000 h.p. will be installed in entirely new developments, or in additions to existing hydro-electric stations. The large number of undertakings in the initial stage of construction and others in active prospect will, when completed within the next few years, result in an addition to the total installation in the Dominion of over 2,000,000 h.p., and will require an aggregate direct investment of over $200,000,000. Rapid progress is being made by the Spruce Falls Company on its Smoky Falls development, and the initial installation of 56,250 h.p. is expected to be completed shortly. The 220,000-V transmission line, 200 miles in length, under construction by the Ontario Hydro-Electric Power Commission, for the transmission of power from the Gatineau River development of the Canadian International Paper Company to Toronto and other Ontario centres is expected to be in operation by October. The Commission will also construct this year a 110,000-V transmission line from Ottawa to Smith's Car Falls to supply power to Eastern Ontario. On the Saguenay River at Chute-A-Caron the Alcoa Power is speeding up the development of a plant which will have an ultimate capacity of 800,000 h.p., four units of 65,000 h.p. each being installed. On the same river the Duke Price Power Company has still two units to install in its Isle-Maligne plant to bring it to its ultimate capacity of 540,000 h.p. One of these units will be installed this year.

Carlisle.—YEAR'S WORKING.—The report of the city electrical engineer (Mr. C. W. Salt) on the working of the electricity undertaking for the year ended March 31st last shows a total income of £84,331, as compared with £83,713 in the previous year. Working expenses decreased from £58,588 to £49,439, leaving a gross profit of £34,892 (£25,125), to which was added an unemployment grant of £6,246, making a total of £41,138, against which capital charges totalling £41,101 had to be met, resulting in a net surplus of £37, as compared with a deficit of £2,989 in the preceding year. The amount spent on capital account during the year was £36,014, and the total now spent on the undertaking stands at £580,207. The total sales of electricity increased from 10,408,707 to 11,947,855 kWh, and the maximum load from 5,450 to 6,900 kW. The new works at Willow Holme were completed during the year, the total cost being £237,479.

Cheltenham.—SYSTEM OF SUPPLY.—The Corporation Electricity Committee is to make application for consent to a change of the a.c. system of electricity supply from single-phase, 100-cycles, 200 V, to single- and three-phase, 50 cycles, 200 V.

Clitheroe.—LOAN.—The Town Council has applied for sanction to a loan of £1,000 for street lighting by electricity. Consumers at Waddington are to be supplied at 8d. per kWh for lighting, and at 1½d. per kWh for power.

Continental.—BELGIUM.—Contracts have recently been placed for the supply of two 25,000-kW turbo-generator sets for the new central power station at Schelle, near Antwerp. The turbines, which are to run at 3,000 r.p.m. will be supplied by Escher, Wyss & Co., Zurich, and the generators by the Société des Ateliers de Constructions Electriques de Charleroi.

Dover.—YEAR'S WORKING.—The accounts of the Corporation electricity undertaking (engineer: Mr. W. J. Broad) for the year ended March 31st last record a total income of £51,755, as compared with £50,953 in 1926-27, and working expenses of £23,760, as against £30,773, leaving a gross profit of £27,995 (£20,180). Capital charges absorbed £19,035, and there was a net surplus of £8,960, as compared with £362 in the preceding year. The sales of electricity increased from 2,859,025 to 2,969,320 kWh.

Eastbourne.—YEAR'S WORKING.—The accounts of the Corporation electricity undertaking (engineer: Mr. J. K. Brydges) for the year ended March 31st last, record a total income of £106,075, and working expenditure of £58,504, leaving a gross profit of £47,571. The figures for the preceding year were:—Income, £93,400; working expenses, £68,109; gross profit, £25,291. After providing for capital charges and making contributions to capital expenditure there was a net surplus of £14,737, as compared with a loss of £248 in the previous year. The capital expenditure during the year amounted to £88,974, the chief items being £24,587 for machinery, and £35,992 for mains and services. The electrical energy sold increased from 8,837,439 to 10,768,838 kWh, and the maximum load from 5,655 to 6,962 kW. The average price obtained per kWh fell from 2.38d. to 2.21d. The second 2,500-kW set was in commission for the greater part of the year, and sanction was received to install a third 2,500-kW set with boiler and cooling tower.

India.—ELECTRICAL DEVELOPMENT.—The Irrigation Branch of the United Provinces Government has put forward a project known as the Ramganga hydro-electric pumping scheme, which is designed to transmit hydro-electric power from an extension of the Bahadurabad power station by means of a h.p. line through Roorki, Najibabad, &c., to Moradabad, in order to supply these intermediate towns with electricity, as well as to pump 200 cusecs from the Ramganga River for irrigation purposes. This line will also be taken to many other towns. Besides providing electrical energy to an urban population aggregating more than 200,000 and irrigating about 50,000 acres of fertile land, the scheme will bring electrical energy within easy reach of a large rural area where it can be made available for pumping tube wells. The total cost of the scheme is estimated at Rs.50 lakhs, and it is proposed to borrow the money required from the Government of India and to start the work in the current year. It is hoped that power will be available in 1929.

The U.P. Government has also sanctioned a similar scheme at Bhola at a cost of Rs.7 lakhs which has already commenced. Another project which is under construction is one for generating power at Palra Falls for pumping 110 cusecs from the Kali Nadi to the Ganga Canal to irrigate 26,000 acres and to supply the Khurja municipality with electricity.

London.—ST. PANCRAS.—*Year's Working.*—The accounts of the Borough Council's electricity undertaking (engineer: Mr. J. T. Baron) for the year ended March 31st last record a total income of £282,205, as compared with £251,449 in 1926-27. Working expenses were lower at £121,028, as against £140,591, leaving a gross profit of £161,176 (£110,858), to which was added revenue from other sources making a total of £161,765. Capital charges absorbed £113,134, and there was a net profit of £48,631 (£16,027). The capital expenditure during the year amounted to £103,674, the chief items being £37,974 for machinery and £32,716 for mains. The electrical energy sold increased from 25,117,946 to 29,614,829 kWh, and the maximum supply demanded from 16,250 to 19,200 kW. The average price obtained per kWh fell from 2.29d. to 2.19d.

ST. MARYLEBONE.—*Year's Working.*—The report of the borough electrical engineer (Mr. C. H. Smyth) on the working of the electricity undertaking for the year ended March 31st last, shows a total revenue of £510,118, as compared with £458,341 in the preceding year. Working expenses decreased from £290,393 to 269,854, leaving a gross profit of £240,264, as against £167,948. Capital and other charges absorbed £188,106, and there was a net surplus of £52,310, as compared with a loss of £12,988 in 1926-27. The net capital expenditure during the year amounted to £107,362, and included £47,359 for machinery, and £41,778 for mains and services. The sales of electrical energy increased from 65,480,016 to 78,264,859 kWh, and the maximum supply demanded, from 35,332 to 45,195 kW. The average price obtained per kWh fell from 1.587d. to 1.442d.

Mexico.—ELECTRICAL DEVELOPMENT.—The report of the Mexican Light & Power Co., Ltd., covering the year ended December 31st last, shows that the electricity generated at its power stations amounted to 606,245,844 kWh, as compared with 593,472,460 kWh in 1926. The installation of a steam plant at Nonoalco, consisting of two 12,500-kW turbo-alternators, with the necessary boilers and auxiliaries is well in hand, and the work is expected to be completed in a few months. Additional generating capacity has been added to the Necaxa system by the installation of one 20,000-h.p. unit at Tepexic, and two units at Texcapa. The Texcapa installation, which comprises one unit of 1,650 kW and one of 4,000 kW, is completely automatic.

Northern Ireland.—BANGOR (CO. DOWN).—At a special meeting of the Town Council a resolution was unanimously passed to the effect that steps be taken immediately to apply to the Electricity Commissioners for Northern Ireland for a Special Order authorising the Council to supply electricity within the borough. The question of establishing a local generating station, or obtaining a bulk supply from the City of Belfast has been considered, and the Council's electrical expert (Mr. Sayers) has reported in favour of a generating station in Bangor.

Oldham.—CHADDERTON WORKS PROGRESS.—Members of the Corporation Electricity Committee recently paid a visit to the new electricity works at Chadderton to view progress. The three new 12,500-kW turbo-alternators are in position, four boilers are ready for pressure testing, another four are being erected, and the switchgear is now being connected up. The station will be ready for opening in October.

Skipton.—LOAN.—Application is being made for sanction to a loan of £5,000 for mains and services. The net profit on the undertaking for the past year was £2,124.

South Africa.—PORT ELIZABETH.—The municipality proposes to raise a loan of £400,000 for extensions to the electricity undertaking.

Special Orders.—Applications have been made to the Electricity Commissioners for special Orders by the Dorking Electricity Supply Co., Ltd., authorising it to supply electricity in the urban district of Dorking, and parts of the rural districts of Dorking and Reigate; the Cannock Urban District Council to supply in certain parishes in the rural district of Cannock; and the Tonbridge Urban District Council to extend its area of electricity supply so as to include parts of the rural districts of Tonbridge and Malling.

The Commissioners have submitted to the Minister of Transport for confirmation, a Special Order made by them authorising Middlesbrough Corporation to supply electricity in part of the rural district of Middlesbrough.

The Minister of Transport has confirmed a Special Order made by the Electricity Commissioners, authorising the Derbyshire & Nottinghamshire Electric Power Co. to supply electricity in the urban district of Warsop, the rural districts of Leake, Newark and Southwell, and parts of the rural districts of Basford, Bingham, Skeby and Stapleford.

Stretford.—Year's Working.—The accounts of the Urban District Council's electricity undertaking (engineer: Mr. T. A. Kerr) for the year ended March 31st last show a total income of £213,568 and working expenditure of £135,580, leaving a gross profit of £77,988. The figures for the preceding year were: Income, £205,270; working expenses, £158,211; gross profit, £47,059. After payment of capital charges there was a net surplus of £24,082, as compared with £8,839 in the previous year. The consumption of electricity for power purposes increased from 43,541,794 to 49,322,389 kWh, and the total sales from 48,168,967 to 54,341,792 kWh. The maximum supply demanded rose from 17,210 to 18,040 kW.

Tring.—Street Lighting.—The Urban District Council has decided to have the whole of the town lighted by electricity, and has accepted the terms of Mr. W. A. Turnbull for the supply of electricity at 9d. per kWh against 9½d. per kWh previously, or £2 7s 3d. per lamp for the season.

Uruguay.—Hydro-Electric Development.—A Special Committee of the Chamber of Representatives having studied, in conjunction with the Minister of Public Works, the scheme for the utilisation of the falls of the Rio Negro for the generation of electricity, has recommended the carrying out of some further preliminary work. For that purpose it has authorised the expenditure of $200,000 (Uruguayan gold) and the appointment of a committee of national engineers and a foreign technical expert, to draw up complete plans which shall serve as the basis for calls for tenders.

West Ham.—Year's Working.—We have received from Mr. F. W. Purse, engineer and manager of the Corporation electricity undertaking, a copy of his report, together with the abstract of accounts covering the year ended March 31st last. Despite a large increase in output, the total revenue was lower at £379,517, as compared with £414,713 in the preceding year, the decrease being due to the general reduction in charges. There was, however, a decrease in working expenses from £259,360 to £205,072, and the gross profit was therefore higher at £174,445, as against £155,353. To the gross profit was added revenue from other sources, making a total of £177,619 available, and after deducting capital charges and special works charged to revenue, there was a net surplus of £50,430, as compared with £52,927 in 1926-27. A contribution of £11,960 was made to the borough fund. The capital expenditure during the year, which included £94,152 for machinery and plant, and £42,390 for mains, amounted to £185,651. The electrical energy sold increased from 74,097,934 to 82,810,561 kWh, of which power and heating supplies accounted for 44,693,119 kWh, and the maximum supply demanded rose from 25,830 to 29,215 kW. The average price obtained per kWh fell from 1.32d. to 1.08d., and further reductions in the electricity charges which have been made will bring the average price to less than 1d. per kWh. The fourth 10,000-kW set and boiler were put into commission during the year, and sanction was received to the installation of a further set of 30,000 kW.

Wimbledon.—Year's Working.—The report on the working of the Corporation electricity undertaking (engineer: Mr. A. E. McKenzie) for the year ended March 31st last shows a total revenue of £155,697, as compared with £144,870 in the preceding year. Working expenses amounted to £75,480, as against £83,298, leaving a gross profit of £80,216 (£61,572), and after meeting capital charges there was a net surplus of £33,090, as compared with £19,951 in 1926-27. The capital expenditure during the year amounted to £125,699, and included £68,154 for mains and services. The sales of electrical energy increased from 15,511,438 to 18,411,699 kWh, and the maximum supply demanded from 7,450 to 9,650 kW. The average price obtained per kWh fell from 2.089d. to 1.887d. Contracts were placed during the year for a further 3,750-kW turbo-alternator, and one 50,000-lb. boiler, and the plant will be ready for operation in time for next winter's load.

Loans.—The Corporation Electricity Committee is applying for sanction to borrow £5,000 to meet expenditure in connection with the wiring of consumers' premises under the maximum demand system of supply. Sanction has been received to a loan of £15,000 for the purchase of domestic appliances.

Tramway and Railway Notes.

Continental.—France.—The Paris correspondent of the *Times* reports that the General Council of the Department of the Seine has authorised the prolongation of four of the "Métro" railway lines outside the City of Paris. The prolonged lines will reach Vincennes, Saint-Cloud, Levallois and Issy-les-Moulineaux. The decision of the General Council is the first step towards the solution of the problem of rapid communication between the centre of Paris and the suburbs.

Poland.—Considérable extensions of electric tramways and light railways in Poland are being made. The Société des Tramways Électriques du Bassin de Dombrowa, a Belgian undertaking, has recently completed and opened for traffic a number of lines in the Dombrowa district, while the Société des Chemins de Fer Électriques Suburbains, another Belgian concern, has completed a line 20 miles in length in the Warsaw district, on which fourteen trains per day are being run.

Spain.—It has been decided to electrify as soon as possible the section of railway between Jaca and Aranones on the French frontier. Particulars may be obtained from the Jefatura de Estudios y Construcciones del Nordeste de España, Calle del Rey Francisco-1, Madrid.—*Reuter's Trade Service* (Madrid).

Work has recently been commenced by the Compania Iberica de Ferrocarrils y Tranvias on the construction of an electric tramway between Valencia, Nazaret and Cullera.

L.M.S. Railway.—Diesel-Electric Locomotive.—A new type of locomotive was inaugurated on the Blackpool, Lytham and Kirkham route of the L.M.S. Railway on July 26th. The motive power is derived from a combination of oil and electricity, the oil engine being of the Diesel type.

London.—"Underground" Breakdown.—A complete breakdown of the Underground Railway system occurred on July 26th, causing a stoppage of all trains, lifts and escalators. The following official statement was issued by the Underground Railway:—"At 11.33 a.m. trouble at Lots Road power station deprived the Underground system of power. Trains and escalators came to a standstill, and the emergency lights in the trains automatically came into operation. The electricity supply was resumed at 11.48 a.m., and within fifteen minutes a full normal service was resumed."

Manchester.—New Depôt.—The new tramcar depôt at Birchfields Road was formally inaugurated by the Lord Mayor on July 24th. The depôt, which will accomodate 230 cars, has entailed a capital outlay of £127,240. At a subsequent luncheon, the Lord Mayor said that in Manchester it would be almost impossible to adopt a general motor-omnibus system at the present time.

Oldham.—Year's Working.—The report on the working of the Corporation tramway undertaking (general manager: Mr. C. Jackson) for the year ended March 25th last, shows a total income of £225,720, and working expenditure of £188,950, leaving a gross profit of £36,770. The figures for the preceding year were:—Income, £227,547; working expenses, £195,658; gross profit, £31,889. To the gross profit was added revenue from other sources making a total of £42,241, and after meeting capital charges and rent of leased lines there was a net profit of £4,017, as compared with £365 in the preceding year. The number of passengers carried increased from 34,491,193 to 34,916,106, and the car miles run from 2,684,867 to 2,821,437. The average total revenue per car mile fell from 20.340d. to 19.201d.

Telegraph and Telephone Notes.

Czecho-Slovakia.—Communication Services.—In 1927 both telegraph and telephone communication was further improved. The telephone department realised a further portion of its programme by the completion of the trunk line between Dresden and Prague. This section was opened in November last by conversations for the first time direct with Paris, Copenhagen, Stockholm, and The Hague. On the Prague to Budapest section the cable was laid from Jihlava *via* Brno to Bratislava. The year's programme was completed with the laying of 467 kilometres of trunk cable. Arrangements have also been made for extending the trunk lines to meet the proposed Polish lines, connection to be made in the direction of Brno, Olomouc, and the Polish frontier. Further linking has been arranged for with the German network in the direction of Prague-Plzen-Nuremburg, and in that of Mistek-Cosel. Inter-urban communication in the individual provinces of Czecho-Slovakia has been extended, so that all the more important towns will be linked with the important long-distance cables. At Prague an automatic telephone exchange for 20,000 connections at Smichov, one for 6,000, and at Vinohrady, one also for 6,000 connections, have been completed. At Zizkov, a new inter-urban telephone exchange for 380 inter-urban lines has been erected. Wireless transmitting stations have been extended, and several added. In respect of broadcasting, an arrangement has been introduced which enables the same programme to be sent out from Prague, Brno and Bratislava.

International Telegraph Conference.—American Representatives.—President Coolidge has appointed three American representatives to the International Telegraph Conference which is to meet in Brussels on September 10th, namely, Mr. C. H. Shedd, of Messrs. Swift & Co., Chicago, Mr. J. Goldhammer, vice-president of the Commercial Cable Co., and the American Minister in Stockholm. The United States, though

not a member of the International Telegraph Union, was invited to send representatives to the conference.—*Reuter* (Superior, Wisconsin).

Switzerland.—AUTOMATIC TELEPHONY.—Quite a number of the telephone exchanges in the Ticino section of Switzerland have recently been converted to automatic operation on the Hasler system. Among them are the exchanges at Morcote, Cerentino, Peccia, Russo, Maggia, Bodio, and Bellinzona. The exchange at Lugano is shortly to be converted to automatic working.

Telephone and Telegraph Development.—MONEY BILL.—The Post Office and Telegraph (Money) Bill, 1928, now passing through Parliament has been introduced to enable the Treasury to issue out of the consolidated fund such sums of money, not exceeding £27,500,000, as may be needed by the Postmaster-General for developing the postal, telephone, and telegraph systems. Some £25,000,000 will be required for the telephone service.

The Telephone Service.—SLOANE AUTOMATIC EXCHANGE.—The Sloane exchange is the third automatic one to be cut into service in the London area and has been manufactured and installed by Standard Telephones & Cables, Ltd. This company is engaged at the present time in the installation of further automatic exchanges in the London area at Langham (which will be known as Welbeck exchange), Temple Bar, Bermondsey, and Fulham. In general the automatic exchange equipment at Sloane is similar to that which has already been installed and put into operation during the last few months at Holborn and Bishopsgate. It has been arranged to cater for an ultimate capacity of 10,000 lines, and is at present equipped for 8,400 subscribers.

GARSTON EXCHANGE.—The change-over of the Garston exchange to the modern system was expeditiously effected on July 28th. Garston is one of the last Merseyside exchanges to be modernised, and the automatic system should greatly add to its efficiency. All the postal and telephone services have been centralised in a new three-storey building which has been erected between Garston and Grassendale. There are over 800 subscribers on the exchange, and provision has been made for a total of 2,000.

Transatlantic Telephony.—FRANCE.—According to figures just published, more than 2,500 telephone calls have been transmitted from Paris to North America since the inauguration of the service on March 28th *via* England.

Radio Notes.

Another Radio "Exchange."—BARROWFORD.—Through the enterprise of Mr. N. Plunkett, the township of Barrowford, near Burnley, is enjoying community programmes. A 10-valve set has been installed at the distributing station, and the postal authorities are said to have run lead-covered wires from the station to the houses, where the only requirement is an efficient loud-speaker. The householder can "plug in" for London, Manchester, or Daventry programmes.

Australia.—GOVERNMENT'S POLICY.—The Australian Prime Minister, announcing the Commonwealth Government's future policy towards broadcasting, said that it was contemplated that the Government would take over the plant and equipment of all privately owned "A" class stations, and that provision would be made for the broadcasting of complete programmes of news and entertainment by private contractors after tender, says *The Times*. The contractors would be paid a percentage on each licence fee. The Postmaster-General would be given power to ensure the maintenance of the standard of programmes by withholding part of the licence fees payable, or by cancelling the contract. Investigation and research work would be financed from the balance of licence fees after paying the contractors. An advisory committee would assist the Postmaster-General in all matters requiring expert technical consideration and in the supervision of programmes. Practically all existing broadcasting licences expire next year, when, it is assumed, the new system will become operative.

Czecho-Slovakia.—LICENCES.—In Czecho-Slovakia, where any radio subscriber can give a month's notice at the beginning of any month to terminate his contract, there were recently 226,748 subscribers, of whom 146,070 were in the Prague postal district. Brünn (Brno) came next with 41,790, and Kosnice (Kaschau) was lowest with 3,721, says *World-Radio*. In Austria subscribers can only give notice just before the end of the year. People terminate contracts even when they are only going away for holidays, knowing that they can resume when they like.

Regional Broadcasting.—NEW LONDON STATION.—The B.B.C. announces that the contract for the buildings for the new London regional station near Potters Bar has been awarded by the Board of Governors to the Anglo-Scottish Construction Company, in competition with several other large contracting firms, and work has started. The design for the building was prepared by Messrs. Wimperis, Simpson and Guthrie, and the specification by the Corporation's engineers, who will directly supervise the construction of the building.

Russia.—Broadcast radio-telephone stations in service, or in course of construction, at the beginning of 1928 in Russia numbered 64. The wave-lengths used range from 60.12 to 1,700 metres, 10 stations using 1,000 m. or over, while the power employed ranges from 0.02 to 40 kW.

The Kazitsky factory at Leningrad has completed a combined 25-kW radio-telephone broadcasting station which can also work as a radio-telegraph station, with a power of 35 kW. The plant was tested in the presence of a special commission of the Commissariat of Posts and Telegraphs, and the results are said to have been excellent. This type of station has been adopted by the Commissariat of Posts and Telegraphs as the standard type for use in the Soviet Union.—*Reuter's Trade Service* (Moscow).

United States.—PATENTS.—The U.S. Commissioner of Patents recently rejected an application for a patent on a variable condenser with plates shaped to give a straight-line frequency effect, says the *Wireless World*, on the ground that it "lacked the dignity of an invention." The decision was sustained by the Supreme Court.

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the ELECTRICAL REVIEW containing the advertisement is given in parentheses below.

Contracts Open.

Birmingham.—August 25th. Asylums Committee. Installation of electric lighting and power at the Winson Green Mental Hospital, Lodge Road, Birmingham (approximately 1,000 lighting points). Specification from the Mechanical Department, 12, The Crescent, Cambridge Street, Birmingham.

Dundee.—August 13th. Corporation. Electric lighting installation at Ashludie Sanatorium (Administrative Block). Specifications, &c. (deposit 2 guineas) from City Engineer.

Forfar.—August 11th. Directors of Forfar Infirmary. Installation of electric lighting in extensions at infirmary. Specifications from Mr. David Watterston, architect, 34, Castle Street, Forfar (deposit £1 1s.).

Harrogate.—August 25th. Electricity Department. Two 2,500-kVA 3-phase transformers, 11,000-V switchgear, and one 30-ton travelling crane. (See this issue.)

India.—MADRAS.—August 14th. Madras and Southern Mahratta Railway Co., Ltd. A.c. motors and starting pillars, paper cables, terminal and joint boxes, rubber cables. (July 20th.)

Irish Free State.—DUBLIN.—August 14th. Electricity Supply Board. Overhead and underground distribution mains and services for Blackrock, Booterstown, Monkstown, Sandycove, and Dalkey. (July 20th.)

August 15th. House service single-phase a.c. meters. House service combined fixed and variable-charge type prepayment single-phase a.c. meters, three-phase, three- and four-wire power meters. (See this issue.)

August 22nd. 32 kiosk and 13-pole type transformer stations with switchgear and transformers. (See this issue.)

Llantarnam.—September 3rd. Urban District Council. H.p. and l.p. switchgear, transformers, and overhead and underground mains. (July 27th.)

London.—METROPOLITAN ASYLUMS BOARD.—August 22nd. Rewiring fire-alarm system at Caterham Mental Hospital. Installation of electric lighting in shore and pier buildings, Long Reach Hospital, Dartford, Kent. (July 20th.)

H.M. OFFICE OF WORKS. August 16th. Steam boiler and feed pumps, &c., at the Forest Products Research Laboratory, Princes Risborough. (July 27th.)

August 13th. Electric cable and wire. (See this issue.)

ST. PANCRAS.—September 4th. Electricity Department. One 15,000-kW generator, condenser, and auxiliaries for the King's Road generating station. (See this issue.)

Islington.—August 14th. Electricity Committee. New lead battery. (See this issue.)

Manchester, — August 14th. Tramways Committee. Sand-drying plant. Specification and form (deposit £1 1s.) from Mr. H. Mattinson, general manager and chief engineer, Corporation Tramways, 55, Piccadilly, Manchester.

New Zealand,—Wellington.—September 11th. Public Works Department. Two 10-cwt. electric travelling indoor cranes. (A.X. 6545.)*
October 30th. Protective relay system. (B.X. 4573.)*
September 4th. Insulating tape. (B.X. 4572.)*
September 25th. Meter-testing equipment for Lake Coleridge. (B.X. 4570.)*

Penistone.—July 31st. West Riding Education Committee. Electric lighting installation at the Grammar School. Specification from Education Department, County Hall, Wakefield.

Portland.—August 15th. Urban District Council. Mains, transformers, and meters. (July 20th.)

Ripon.—August 14th. Electricity Department. Transformers, e.h.p. and l.p. switchgear and cable connections. (July 20th.)

Salford.—August 13th. Electricity Department. One 20,000-kW turbo-generator set with condenser and auxiliaries. (July 13th.) Two water-tube boilers, with stokers, fans, motors, preheaters, &c. (July 20th.)
August 11th. Town Council. Re-wiring of portion of Municipal Offices, Regent Road. Specifications from the Medical Officer of Health, 143, Regent Road.

South Africa.—Johannesburg.—September 11th. Rand Water Board. Turbo-generator for the Vaal River scheme. (B.X. 4585.)*
August 30th. Town Council. Street-lighting time switches. (B.X. 4584)*
Volksrust.—September 11th. Municipal Council. Switchgear, motors, meters, cables, &c. (B.X. 4599.)

Stockport.—Electricity Department. 5,250 yd. cable. (See this issue.)

Stoke-on-Trent.—September 12th. Electricity Department. Two water-tube boilers (60,000 lb. per hour). (See this issue.)

Stourbridge.—August 8th. Board of Guardians. Electric light installation for the Wordsley Institution. Master of the Institution.

Stretford.—August 16th. Electricity Department. 9,200 yd. 33,000-V cables. (July 27th.)

Swindon.—August 18th. Electricity Department. Storage battery, three turbine-driven boiler feed pumps. (See this issue.)

Uruguay.—Montevideo.—August 22nd. State Electricity Department. Gasfilled metal-filament lamps. (B.X. 4560.)*
September 10th. 338,000 metres of insulated conductors for outdoor use (Hackethal type). (B.X. 4589.)*
September 3rd. 155,000 metres of r.i. wire for indoor installations. (B.X. 4590.)*

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed.

Australia.—Sydney.—City Council.
L.p. cables (£8,721).—Siemens (Aust.) Pty., Ltd.
H.p. cables.—Siemens (Aust.) Pty., Ltd. (£7,247); W. T. Henley's Telegraph Works Co., Ltd. (£3,548); Enfield Cables (Aust.), Ltd. (£4,699).
L.p. switch panels (£11,091).—Metropolitan-Vickers Electrical Co., Ltd. —*Tenders.*

Birmingham.—Education Committee. Accepted :—
Electric lighting installation at Birches Green Council School (£430), R. H. Newton; at Tiverton Road School (£194), J. H. Payne & Co.; electrical work at Kings Norton Secondary School (£445), Ray Electrical Co.; at Yardley Secondary School (£185), T. Glover; at Aston Technical College (£145), E. Hill & Sons.

Brighton.—General Purposes Committee. Accepted :—
Wiring work at new aquarium (£2,179).—Pinching and Walton.

Dover.—
Electric lighting and heating installation at the new Isolation Hospital, Dover.—E. R. Longley.

Durham.—County Education Committee. Accepted :—
Electric light installation at new school, Nettlesworth (£80), and at Remodelled School, Thornley (£135), Simm & Richardson (Newcastle); at Colliery Council School, Blackhall (£297), and at Council School, Fishburn (£75), F. Reid Ferens & Co., Sunderland.

Erith.—Urban Council. Accepted :—
Cables, &c., for supplies to the mills of Cannon & Gaze and the Thames Milling Co., at £3,834.—Callender's Cable and Construction Co., Ltd.

Leeds.—Electricity Committee. Accepted :—
Cables.—(£1,895), W. T. Henley's Telegraph Cable Works Co., Ltd.; (£850), Enfield Cable Works, Ltd.; (£1,236), Macintosh Cable Co., Ltd.; and (£2,001), Greenwich Cable Works, Ltd.
Air compressor (£555).—Lead Wool Co., Ltd.
Overhead crane for Kirkstall power station (£3,675).—Isles, Ltd.

Leicester.—Electricity Committee. Recommended :—
Switchgear (ironclad type) (£23,672).—Ferguson, Pailin, Ltd.
One 1,000-kVA transformer (£395).—Hackbridge Electric Construction Co., Ltd.
Switchgear and cabling for transformer (£1,370).—English Electric Co., Ltd.
Four preheaters at central station (£9,000).—Howden Ljungström Preheaters (Land), Ltd.

London.—Westminster.—Baths Committee.
Electric lift at Buckingham Palace Road baths (£835).—Hammond Bros. & Champness, Ltd. (Recommended.)

Poplar.—Electricity Committee. Recommended :—
15,000-kW generator (£49,000).—Fraser & Chalmers Eng. Works.
Evaporating plant (£1,625).—Vickers-Armstrongs, Ltd.
Feed pump (£618).—G. & J. Weir, Ltd.
Switchgear, transformer and cable (£18,250).—Metropolitan-Vickers Electrical Co., Ltd.
Coal conveyor (£1,325).—New Conveyor Co., Ltd.
Boiler house and fuel equipment (£78,000).—International Combustion Co., Ltd.

London County Council.—Education Committee.
Electric wiring and fittings at Drury Lane Institute :—

	£
Stegman & Co. (recommended)	612
Alex. Hawkins & Sons	674
Berkelev Electrical Engineering Co., Ltd.	684
Alpha Manufacturing and Electrical Co., Ltd. ...	685
Cox-Walkers	688
W. H. Gaze & Sons, Ltd.	732
L. G. Tate & Co., Ltd.	745
A. Dean & Co., Ltd.	779
Griggs & Son	797
J. Briggs, Electrical Contractors, Ltd.	800
Pinching & Walton	860

Highways Committee.
Soot and flue dust extraction plant at Greenwich power station :—

Pneumatic Conveyance and Extraction Co., Ltd. (accepted)	£7,920
British Vacuum Cleaner and Engineering Co., Ltd.	11,002

War Office.
Twelve months' supply of electric lamps.—Stella Lamp Co., Ltd.

Plymouth.—Health Committee. Accepted :—
Repairing electric batteries at the sanatorium (£421).—Chloride Electrical Storage Co., Ltd.

Reading.—Board of Guardians. Accepted :—
Installing electric light in four blocks at the Infirmary (£421).—Callas, Sons & May, Ltd.

Salford.—Electricity Committee. Recommended :—
1,290 yards of l.p. cable (£1,096).—N.V. Nederlandsche Kabelfabriek (Delft).
E.h.p. cable (£777).—W. T. Glover & Co., Ltd.

Wrexham.—Board of Guardians. Accepted :—
Installing electric light at Croesnewydd Hospital at £345.—Messrs. Thornton.

The "Electrical Review" Service Department.

Inquiries must be accompanied by a stamped addressed envelope.

We should be glad to learn the names and addresses of makers of the following :—

Elite insulated staples.
Eddy current brakes for testing motors up to 2 h.p.
Steel troughing of small section used for enclosing tough-rubber cable.
Very small motors (a.c. and d.c.) suitable for operation of window signs or advertising figures.
English agents for "Robin," "Kora," "Weldflo" and "Elecweld" electrodes for electric welding (American manufacture).

Notes.

Electricity Charges in Wandsworth.

At the meeting of the Wandsworth Borough Council on July 24th, Alderman A. W. Mathias submitted a report on the recent conference between the County of London Electric Supply Co., Ltd., and representatives of the Borough Council and of the Consumers' Organising Committee, it being practically identical with the report published in our issue of July 20th last. The deputation was received, stated Alderman Mathias, with the greatest courtesy by the company, but had not obtained much in the way of definite results. The proposed multi-part tariff would help small houses. A house rented at about £40 per annum would have to pay a fixed charge of 15s. per quarter and 1d. per kWh. Supposing the house consumed 300 kWh, the total cost would be £4 5s. per year, whereas under the present system the same house would have to pay about £7 10s. per annum. That was a large reduction, but it did not affect other such consumers as traders, shopkeepers, manufacturers, hospitals, churches, chapels, and public halls; all those were omitted from the multi-part tariff. He (Alderman Mathias) had suggested to the company that it would only affect 25 per cent. of the consumers and ignore the remaining 75 per cent. The deputation had pressed this objection very strongly indeed. Feeling that the Council was behind it, the deputation put forward the claims of traders and shopkeepers to the same facilities as private houses. Wandsworth should come into line with its neighbours and obtain cheap electricity. Proceeding, the speaker remarked that the company proposed to offer tradesmen a lower rate for shop lighting after closing hours; yet there were few traders (about one in forty) who lit their windows after the shops were closed. What they wanted was a lower price for lighting in business hours. He did not think that Sir Frederick Hall, one of the directors of the County Co., who received the deputation, realised the strength of the opposition behind it. Lord Gainford, another director who was present at the Conference, appeared to realise it more fully. Alderman Mathias then read a letter from the Company, which stated that further consideration was being given to the points raised. "What we are aiming at," concluded the Alderman, "is 4d. per unit for lighting. If the multi-part tariff does not bring the price down below the present 6d. it will not suit us." The report was unanimously adopted by the Council.

Road and Traffic Signs.

At a conference held in London on July 24th, called by the British Engineering Standards Association, at the request of the Association of Public Lighting Engineers, the standardisation of signs and signals for erection on roads was considered. Whilst the Conference did not feel that the time was yet ripe to recommend the setting up of a committee for that purpose, the B.E.S.A. was asked to call them together again in about six months' time to consider the matter further. Lt.-Col. K. Edgcumbe, chairman of the Conference, explained that the object to be achieved by setting up a committee of the B.E.S.A. would be to provide a clearing house for particulars of all the experimental work now going on in different parts of the country, with a view eventually to agreed standard forms being published. Several speakers called attention to the present chaotic conditions, and urged the necessity for immediate action. The Ministry of Transport, the Automobile Association, and a number of those representing the County Associations urged delay in view of the importance of having the matter looked at also from an international point of view, and it was finally agreed that the Conference should adjourn and meet again in six months' time.

Colliery Officials' Qualifications.

The departmental committee recently appointed by the Secretary for Mines to consider the qualifications of colliery officials has considered the scope of its inquiry under its terms of reference, and is now ready to receive and consider memoranda under specified headings, including the necessity for prescribing specific qualifications for any class of electrical engineers. The Committee has issued an invitation to representative institutions to submit memoranda, and extends a similar invitation to other bodies and individuals who may also desire to express their views. After considering the memoranda submitted, the Committee will at a later date invite selected associations and individuals to give oral evidence.

Leith Grain Elevator.

A new grain elevator at Leith Docks has been declared open. Two pneumatic plants, erected on the North Quay of the Edinburgh Dock, near which the elevator stands, are of the travelling type, and can, therefore, be placed at any point to suit the hatches of the grain ship to be discharged. They are each capable of discharging 150 tons of wheat per hour from a ship lying alongside, and can automatically deliver the grain on to either of two conveyor belts which are placed in the gantry over the roof of the dock sheds. In order to supply the additional electrical energy required for the new plant, a new electric sub-station has been erected adjacent to the warehouse. An interesting feature of this station is that it will be controlled from the switchboard of the Dock Commissioners' main station at the Albert Dock, nearly a mile away. It is probably the only sub-station in Scotland which is remotely controlled in this manner.

Central Scotland Electricity Scheme.

The first six of the steel towers which will carry the Central Electricity Board's main transmission lines have now been erected in Scotland, three double-line and three single-line towers having been put up between Mid-Calder and Edinburgh for inspection on the site. The inspection was attended by Sir Andrew Duncan, chairman of the Central Board; Sir James Lithgow, Bt.; Sir Reginald Blomfield, the architect advising the Board; and Mr. Archibald Page, the Board's chief engineer; along with the consulting engineers and the contractors' representatives. The party was well pleased with the general appearance of the towers and with the way in which they harmonise with their surroundings. The inspections and test trials of the steel towers which will carry the national electricity grid throughout the country have now been completed, and rapid progress is expected to be made with their erection. The contractors are already engaged in preparing the necessary foundations along the routes.

The British Association.

The preliminary time-table for the Glasgow meeting of the British Association for the Advancement of Science contains a number of matters of electrical and allied interest. Among the papers, &c., to be presented are the following: "A Means of Promoting the Co-operation of the Worker in Industry," by Mr. S. Mavor; a joint discussion by the Engineering and Education Sections on "School, University and Practical Training in the Education of the Engineer"; presidential address to the Engineering Section by Sir William Ellis, G.B.E. ("The Influence of Engineering on Civilisation"); "Recent Developments in High-Pressure Boilers," by Mr. H. Yarrow; "Ultra-violet Radiations from Point Discharges," by Mr. J. Thomson; presidential address by Prof. A. W. Porter, F.R.S., to the Mathematical and Physical Science Section ("The Volta Effect: Old and New Evidence"); "Magnetic Storms," by Mr. A. H. R. Goldie; "Cycles for Internal Combustion Engines," by Prof. W. J. Goudie and Prof. E. F. Witchell (two papers); "Frequency Variations of the Triode Oscillator," by Mr. D. F. Martyn; "Ultra-violet Lamps and their Standardisation," by Prof. F. G. Baily; "Spark Ignition" (lecture and demonstration), by Prof. E. Taylor-Jones; discussion on "The Scattering of Electrons by Crystals"; "The Possible Application of High Frequency to Power Supply," by Prof. W. Cramp; "Experimental Methods for Determining the Distribution of Electric and Magnetic Fields," by Mr. B. Hague; "The Jet Wave and its Application," by Dr. J. Hartmann; "The Condenser Telephone," by Dr. G. Green; "Standardisation in Industry," by Mr. C. Le Maistre; and the report of the Committee on Electrical Terms and Definitions (papers by Professors G. W. O. Howe, C. L. Fortescue and W. Cramp). Among the visits which have been arranged for the meeting is one to the works of Messrs. Mavor & Coulson, Ltd. The meetings will all be held in the University, Section G—Engineering being allotted the Engineering Department.

Fatality.

Stewart Addison, electrician, Dundee, employed by the contractors for the Lochaber hydro-electric scheme, received a fatal electric shock at the works near Fort William on July 24th. He had apparently ascended one of the poles carrying live wires without operating the cut out, and it is assumed that he came into contact with a line conveying electricity at 11,000 V.

Educational.

UNIVERSITY OF BIRMINGHAM, ELECTRICAL ENGINEERING DEPARTMENT.—The Session 1928-29 commences on October 1st. Detailed syllabus with full particulars of University regulations, lecture and laboratory courses, fees, &c., can be obtained from the Registrar. (See our advertisement pages to-day.)

Frequency Changer for High-speed Motors.

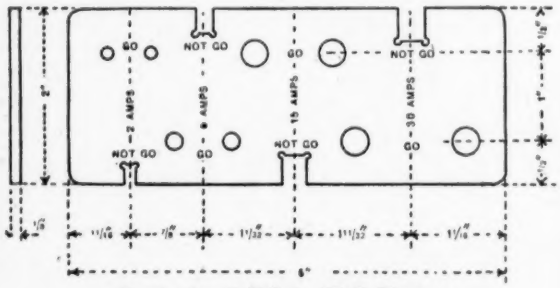
One of the largest shop-fitting factories in Great Britain has recently been erected by Messrs. Boots, Ltd., in Nottingham. For the electrical driving the individual method was adopted on the score of economy and because group driving would necessitate line shafting with consequent strengthening of the construction of the building. The installation comprises upwards of eighty motors with a total capacity of nearly 700 h.p., and it is interesting to note that practically the whole of them are directly coupled to the machines, in spite of the fact that certain of them run at 3,900 r.p.m. Power is received from the Nottingham Corporation supply mains at 11,000 volts, 3-phase, 50 cycles, and is stepped down to 400 volts for use in the factory by means of a 300-kVA transformer. For the higher-speed motors a supply is taken from a frequency changer at 66.5 cycles. The frequency-changer set consists of an auto-synchronous motor directly coupled to a 30-kW alternator generating at 400 volts, 3 phase. The motor has an input of 100 kVA and is capable of correcting the power factor of a load of 200 kW from .78 to .95 lagging; further correction is possible when the set is running light. The frequency changer is started by means of a G.E.C. auto-transformer starter. The high-speed motors are used for driving planing machines, three 5-h.p. motors being directly coupled to the cutter blocks of 15-in., 20-in., and 24-in. hand-feed planers, respectively, each being controlled by a star-delta starting

panel. A 20-h.p. and a 15-h.p. motors drive a double-planing and thicknessing machine, the first motor being directly coupled to the top cutter block, while the bottom cutter block and feed gear are belt driven by the smaller machine.

The contract for the electrical plant driving the wood-working machinery was placed with the General Electric Co., Ltd., the motors and control gear being manufactured at the company's Witton works.

Gauges for British Standard Plugs and Sockets.

The British Engineering Standards Association is making arrangements to issue a simple form of template gauge for the purpose of checking the dimensions of British standard two-pin wall plugs and sockets. With the assistance of the National Physical Laboratory a suitable template has been designed, and sample gauges have been manufactured. These have been checked by the N.P.L., and, having been found satisfactory for the purpose for which they were designed, have been stamped with the N.P.L. monogram. It should be emphasised that it is not intended that these gauges should supplant those which are used by manufacturers, which are referred to in B.S.S. No. 73-1927; they are intended merely as a safeguard against the delivery of non-standard sizes, and are therefore simpler in form than the manufacturers' gauges. The form of the gauge is shown in the accompanying sketch, from which it will be seen that for each size of plug



Gauge for B.E.S.A. Wall Plugs.

there is a "Go" gauge consisting of two holes accurately spaced, and a "Not-Go" gauge consisting of a slot. Owing to the fact that the pins of the plugs are "sprung" (slotted), and are therefore liable to "give" if one attempts to force them through a "Not-Go" hole, it has been considered that no useful purpose would be served by a "Not-Go" gauge consisting of two holes. The "Not-Go" slot on the proposed gauge is intended as a check on the diameter at the base of the pin, *i.e.*, below the slotted portion. The price of these gauges, checked, and marked with the N.P.L. monogram, will be 8s. each, and, in order that the B.E.S.A. may proceed with the necessary arrangements for the manufacture of the gauges, readers desiring to purchase one or more gauges are asked to communicate with the Secretary, 28, Victoria Street, London, S.W.1. No remittances should be sent with orders, but prospective purchasers will be notified immediately the gauges are available.

Radio for Fishing Fleets.

The first delivery of five trawlers out of 25 for the Consolidated Fisheries, Ltd., as an addition to its Swansea fleet, will shortly be commissioned, and they are to be equipped with Marconi radio apparatus somewhat similar to that with which the present Swansea fleet is fitted. The transmitters will be of the 0.25-kW quenched-spark type, which is of sturdy construction and compact. The two-valve receivers can be tuned to all the wave-lengths in commercial use from 300 to 25,000 metres. A modified form of direction-finding receiver has been adapted to the requirements of smaller vessels; a powerful amplifier is used with a small frame aerial contained in a water-tight box, and the amplifier covers two ranges of wave-lengths (170 to 240 metres and 600 to 1,100 metres) enabling approximate bearings to be taken of other ships, coastal stations, and the beacon transmitting stations.

The Southern Whaling and Sealing Co., Ltd., is making important additions to the existing Marconi installations of its fleet for the coming season. During the last two seasons good use was made by the whale catchers of the wireless telephones with which they are fitted. The sets are operated by the gunners, and enable the individual ships of the fleet to keep in touch with each other and with their headquarters at South Georgia and the South Shetlands. The *Southern Empress* is the new floating factory ship for the South Shetlands, and will be accompanied by three whale catchers: they will be equipped with telephone sets and direction finders, for fog or snowstorms normally cause considerable delay in whale catching, and there is always a fear of losing the "mother" ship. The *Southern King* is attached to the South Georgia headquarters, carrying out the materials, stores and men for the season, and returning with oil. At the headquarters, a telephone set similar in power to that carried by the whale catchers is installed, but with an additional device that enables it to be used as a telegraph transmitter on the normal wave-length for ships. Four whale catchers are attached to headquarters, each of which carries a wireless telephone. The *Southern King* and *Southern Empress* carry more equipment than the rest of the fleet, because of their different duties; in addition to the telephone equipment, short-wave transmitters are installed to keep the two ships in communication with British Post Office stations from the Antarctic, thus placing them in practically direct communication with their owners. Quenched-spark transmitters for working with other ships and with local coastal stations during the voyage are installed, and also direction-finders. Advantage has been taken of the high amplification factor of screened-grid valves to incorporate two of them in each direction-finder. The result has been to increase the selectivity and sensitivity of the amplifier, with which a fixed-frame aerial system is used.

Appointments Vacant.

Temporary engineer (70s.+) for the Cuckfield Board of Guardians. Shift charge engineer for the Leigh (Lancs.) Corporation Electricity Department. Technical assistant (£400 to £600) for the British Electrical Development Association. Meter tester for the Halifax Corporation Electricity Department. Junior technical officer for the Admiralty Experimental Establishment. Electrical engineer (Rs.800 per month) for the Cauvery Metur Reservoir Project, Madras. Junior assistant (£3) for the Dearne District Electricity Board. (See our advertisement pages to-day.)

Magnetic Exploration.

After taking aboard additional recording instruments the non-magnetic yacht *Carnegie*, belonging to the Carnegie Institution of Washington, left Plymouth recently on the first stage of a world-wide three years' magnetic survey of the oceans and of deep-sea life. The *Carnegie*, which is a sailing ship, was built specially for electrical and non-magnetic research work, and was therefore constructed almost entirely of non-magnetic materials. In the entire vessel there is not much more than a ton of iron or steel, and what little there is is placed so far away from the delicate instruments with which she is equipped as to have no effect on them. Her engine, of 100 h.p., petrol driven, is almost entirely of bronze, the cooking stoves are of bronze, the galley utensils of aluminium or copper, and when the crew, whose trouser-buttons are even of bone and belt buckles of silver or brass, sit down at table on the mess deck they use cutlery of silver.

The present voyage of the *Carnegie* is expected to last until September, 1931, and will embrace about 110,000 miles. The purpose is to conduct research in terrestrial magnetism, and special attention will be given to the daily variation of the electric pressure of the atmosphere, a curious point about which is that the daily variations seem to come at absolutely the same time the world over. The scientists of the *Carnegie* hope to secure information which will serve to explain this mysterious phenomenon. The electric conductivity of the air will also be studied, as well as the dynamics of the sea, the causes of movements of vast bodies of water relatively to one another, and the nature and derivation of inorganic marine deposits by the sampling of bottom muds and sediments.

To facilitate these investigations the *Carnegie* is equipped with a non-magnetic winch capable of reaching a depth of 20,000 feet, and the United States Navy Department has loaned to the expedition the latest type of sonic depth finder, an electrical apparatus designed to measure the depth of ocean floors by recording the time required for sound waves to reach the bottom and be reflected back to the surface. Among the other scientific equipment of the vessel are a radio laboratory, a galvanometer house, electromagnetic instruments for measuring electric conditions at any place in the ocean, and sensitive apparatus for recording differences of temperature and salinity down to 20,000 feet.

The first port of call will be in Iceland, and other places to be visited in order are Barbados, Panama, the Society Islands, Easter Island, Peru, Japan, California, Honolulu, Samoa, New Zealand, Cape Horn, South Georgia, South Africa, Ceylon, India, and Western Australia. The South Pacific will then be re-crossed, and after rounding Cape Horn the *Carnegie* will go to Buenos Ayres, Argentina, St. Helena, Madeira, and back to the United States.

The scientific members of the expedition and their special fields of activity are: Captain J. P. Ault, commander and chief of the scientific staff; Wilfred C. Parkinson, senior scientific officer, atmospheric electricity and photography; Oscar W. Torreson, navigator and executive officer, magnetism, navigation and meteorology; F. M. Soule, observer and electrical expert, magnetism and physical oceanography; H. R. Serwell, chemist and biologist, oceanography; J. H. Paul, surgeon and observer, medical work, meteorology and oceanography; W. E. Scott, observer, navigation and commissary; and Lawrence A. Jones, radio operator and observer, radio investigation and communication. The sailing staff consists of seventeen men, making the total number on board twenty-five.

Sydney Bribery Charges.

The Sydney (N.S.W.) correspondent of the *Daily Telegraph* reports that Mr. S. Y. Maling, former deputy manager of the Sydney Electricity Department, was, on July 31st, sentenced to six months' hard labour and fined £500 for receiving a secret commission from Messrs. Babcock & Wilcox, Ltd., in

connection with a large power plant contract for the Department. Mr. Maling has given notice that he will appeal against the sentence. The magistrate granted a certificate of exemption from criminal proceedings to Mr. A. J. Arnot, the Australian manager of Babcock & Wilcox, Ltd., who gave evidence for the prosecution.

Thomas Recording Calorimeters.

The Cambridge Instrument Co., Ltd., the manufacturer of the Thomas recording calorimeter for the accurate measurement of the calorific value of gas, informs us that, after making tests on one of the latest instruments, the Gas Referees are prepared to prescribe the calorimeter for use in official testings.

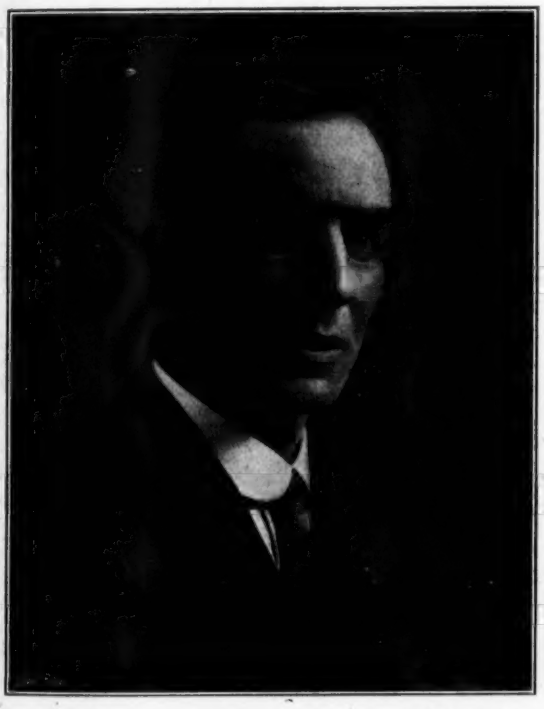
Radiology Congress.

The Crown Prince of Sweden, on July 24th, declared open at Stockholm Concert House the second International Congress of Radiology. Some 1,200 delegates from all parts of the world were present, including 80 English scientists. The King received all the delegates at the Royal Palace. The most important items on the agenda of the Congress are the British recommendations for X-ray protection and for the accurate estimation of doses of radium for therapeutic purposes. An exhibition of apparatus was held at Lillievalchs Exhibition Hall, in which many British manufacturers of X-ray and radiological apparatus took part. This is the first occasion on which it has been possible for British manufacturers to show their products on a large scale abroad.

Our Personal Column.

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.

At the monthly meeting of the London and Home Counties Joint Electricity Authority, held on July 25th, it was unanimously decided to elect Mr. W. F. MARCHANT, O.B.E., L.C.C., as chairman of the Authority in succession to Alderman Sir Duncan Watson, J.P., M.I.E.E., who has resigned the position owing to the great amount of work entailed by his duties as a member of the Central Electricity Board. Mr. Marchant was mayor of the Metropolitan Borough of Deptford in 1914-15, and a member of the Deptford Borough Council for about twelve years. Since 1921, he has been a member of the



Lang Sims] [*Brixton, S.W.*

Mr. W. F. Marchant, O.B.E.

The new Chairman of the London and Home Counties Joint Electricity Authority.

London County Council, and served as a member of the Special Electricity Committee appointed by the L.C.C. to deal particularly with problems relating to the development of electricity in the County of London. Mr. Marchant was elected as one of the members to represent the L.C.C. on the London and Home Counties Joint Electricity Authority upon its institution in 1925.

During the war Mr. Marchant was captain and adjutant in the London Regiment. He was mentioned in dispatches, and was awarded the O.B.E. (Military Division) in 1919.

We reproduce herewith a portrait of Mr. J. F. COLQUHOUN, the public lighting enginer of Sheffield, who has been elected president of the Association of Public Lighting Engineers. Mr. Colquhoun was primarily interested in gas illumination; he entered the service of the Glasgow Corporation Gas Department about 25 years ago. He was trained in the distribution department and was later given a responsible position in the department. He was then transferred to the Public Lighting Department, where he gained experience of all branches of illumination, including the photometric testing of gas burners and electric lamps in the laboratory and in the streets. He was responsible for the lay-out of some of Glasgow's lighting schemes and made a complete reorganisation of the administrative side of the department. When Glasgow applied for increased powers with regard to public lighting, including a special assessment for the purpose, Mr. Colquhoun assisted in the preparation of the evidence which was placed before Parliamentary Commissions in 1912 and 1914. While at Glasgow he founded the Glasgow Lighting Association and became its president. He secured his present appointment in 1924 and since that time has done a great deal to improve Sheffield's public lighting, as visitors to the recent Conference

Mr. J. F. Colquhoun.

President of the Association of Public Lighting Engineers.

of the Association will have noticed. Mr. Colquhoun was responsible for the formation of the Sheffield Illumination Society and is honorary president of that body. In addition he is a member of the Illuminating Engineering Society and of the Street-Lighting Committee of the British Engineering Standards Association.

The marriage took place on Tuesday last of Lieut. FRANCIS V. DU PASQUIER, R.N., and Miss MARY K. S. MILES, at St. Peter's Church, Cranley Gardens. The bridegroom is the son of Mr. A. E. du Pasquier, of the Metropolitan-Vickers Electrical Co., Ltd., and the event will be of interest to Mr. du Pasquier's friends in South Africa, for he was president of the S.A. Institute of Electrical Engineers for two successive years.

Mr. D. S. BADDELEY, A.M.I.E.E., informs us that he has resigned his position as resident engineer and manager with Messrs. Crompton-Parkinson, Ltd., after twenty-two years in Glasgow with them.

The Wolverhampton Town Council has increased the salary of the borough electrical engineer (Mr. E. MORGAN) from £1,000 to £1,250 per annum as from August 5th.

With further reference to the note in our issue of June 29th (p. 1143) regarding the pending retirement of Mr. T. B. GOODYER, the Croydon tramway manager, we now learn that the Croydon Town Council has decided to retain Mr. Goodyer's services in a consultative capacity at a salary of £400 per annum.

The West Ham Town Council has increased the salary of the tramway manager, Mr. SLATTERY, from £850 per annum, plus Civil Service bonus, to £900, with annual increments of £50 to a total of £1,000 a year, plus bonus.

The Gillingham (Kent) Town Council has increased the salary of Mr. S. HARTLAND, mains assistant, from £260 to £286 per annum.

The marriage took place at Ware, Herts., on July 19th, of Lieut.-Col. ARTHUR TYLER-HITCH, D.S.O., M.C., A.M.I.E.E., and Miss KATRIN M. M. WILLIAMS.

The marriage took place on July 28th of Mr. R. M. HAWKINS, M.C., sales manager of Belling & Co., and Miss Z. B. WILLIAMS, of Holmwood, Turvey, Beds. From the staff of Belling & Co. the bridegroom received a set of cutlery.

The West Midlands Joint Electricity Authority has appointed Mr. E. F. HETHERINGTON, M.I.E.E., M.I.Mech.E., as its engineer and manager in succession to Mr. S. T. Allen, who is taking up the post of the Central England Engineer under the Central Electricity Board.

The Bolton Electricity Committee, on July 27th, considered the appointment of a borough electrical engineer and manager, and selected Mr. HAROLD E. ANNETT. The salary is £1,250 a year, rising by £75 a year to £1,400. On the resignation of Mr. W. J. H. Wood, a year ago, Mr. Annett, who had been on the staff for several years, was appointed engineer-in-charge at a salary of £1,000 a year.

The Establishment Committee of the Plymouth Corporation has deferred consideration until its next meeting of the Electricity Committee's recommendation that the salary of the electrical engineer, Mr. E. G. OKEY, shall be stabilised at £900 per annum, rising by two increments to £1,000 per annum.

Mr. H. W. BOSWORTH, a director of the Lancashire Dynamo and Motor Co., Ltd., is leaving London to-day (Friday) for a business visit to Singapore, Australia, New Zealand and South Africa. He expects to be in Australia during November and December, where his address will be c/o the company's various agents. He will be returning to England, *via* South Africa, in February.

We are very interested to learn that Mr. W. E. BUSH has resigned his position with the E.L.M.A. as manager of the Lighting Service Bureau, and has accepted an appointment as general sales manager with Curtis Lighting (Europe), makers of the well-known range of "X-Ray" reflectors and lighting equipment. The Bureau was inaugurated five years ago and under Mr. Bush's direction has done an enormous amount of useful work. We are sure that E.L.M.A. will feel the loss of Mr. Bush very keenly, as will those of us who have received many courtesies at his hands during the time he has been at the Bureau. We offer Mr. Bush our most cordial good wishes for success in his new position.

Obituary.—MR. J. C. LITTLE.—Mr. John C. Little, general manager of the Tyneside Tramways & Tramroads Co., was taken ill while on holiday, and died on July 25th at his residence, Wallsend. Deceased was the youngest son of the late Mr. Joseph Little, a former deputy-governor of Newcastle Prison. He was born in the city, and had been with the Tyneside tramways almost from their inception. Mr. Little took an active interest in a number of local movements. He leaves a widow, but no family.

MR. H. LLOYD.—The *Chloride Chronicle* reports the death, on July 3rd, of Mr. Herbert Lloyd, a director of the Chloride Electrical Storage Co., Ltd., since 1903. He was also chairman of the board of directors of the Electric Storage Battery Co., of Philadelphia. Mr. Lloyd was born in Wales, and although domiciled in the United States, frequently visited this country.

MR. G. H. E. ANGER.—A funeral service took place on July 26th, for the late Mr. G. H. E. Anger, of Brooklands, Ashton-on-Ribble, son of Mr. I. E. Anger, formerly manager (from its inception) of the United Electric Car Co. Deceased was managing director of Anger Manufacturing & Supply Co., Ltd., Grosmont, Yorks. He was born in New York State in 1876, and he eventually made his home in England. The interment will take place in the United States.

Financial Section.

New Companies, Returns of Share Capital, Debenture Changes, Reports of Electrical Companies Dividend Results, Transactions in Stocks and Shares.

New Companies Registered.

French Phototone, Ltd.—Registered as a public company July 27th. Nominal capital: £250,000 in 5s. shares. Objects: To carry on in France or elsewhere, the business of manufacturers and producers of and dealers in gramophones, kinematograph films, phonographic records, and musical instruments; electricians, manufacturers of and dealers in apparatus for receiving, transmitting, recording, producing and reproducing sound of all kinds, &c., and to adopt four agreements with British Brunswick, Ltd., Ledbury Syndicate, Ltd., British Photophone, Ltd., and the French, British and Foreign Trust, Ltd., respectively. The subscribers are: G. E. Garrett, The Cottage, Betchworth, Surrey; L. Walsh, 85, Ferndale Road, Woodside, Surrey, clerks, and five others. The first directors are to be appointed by the subscribers. Solicitors: Kenneth Brown, Baker, Baker, Lennox House, Norfolk Street, Strand, W.C.2.

Super-Electric Heaters, Ltd.—Private company. Registered July 25th. Capital, £3,000 in £1 shares (1,000 10 per cent. cumulative preference and 2,000 ordinary). Objects: To acquire the business of manufacturers of electrical heating apparatus, &c., carried on by G. W. Close and A. E. Ormondroyd at Lever Street, Wolverhampton. The permanent directors are: G. W. Close, Derwent House, Upper Villers Street, Wolverhampton; A. E. Ormondroyd, The Chestnuts, 139, Showell Green Lane, Sparkhill, Birmingham; T. W. Ward, 148, Station Road, King's Norton, Birmingham. Secretary: A. E. Ormondroyd. Registered office: Lever Street, Wolverhampton.

Ringsdorff Carbons (England), Ltd.—Private company. Registered July 24th. Capital, £5,000 in £1 shares. Objects: To carry on the business of dealers in, vendors or manufacturers of carbon brushes for dynamos, motors, magnetos, and other electrical purposes, brush-holders, brush-holder components, contacts and controllers; arc lamp, battery and kinema carbons, electric heaters, &c., and to enter into an agreement for the acquisition of Trade Mark No. 457,744. The directors are: L. E. Harris, 37, Friends Road, Croydon, engineer; S. E. Smith, Barnstaple Close, Thorpe Bay, incorporated accountant. Secretary (*pro tem.*): S. E. Smith. Registered office: 66, Victoria Street, S.W.1.

New Traction Co., Ltd.—Private company. Registered July 25th. Capital, £5,000 in £1 shares. Objects: To acquire any inventions, patent and other rights, for or in respect of any light railway, road railway, tramway, or other means of communication or conveyance by any loco-tractor or other system, &c. The subscribers (each with one share) are: Mrs. L. Boston, 3, Park Lane, Southwold, Suffolk; H. T. Baker, P.C., 42, Queen Anne's Gate, S.W.1. The first directors are to be appointed by the subscribers. Secretary: J. B. Roberts. Solicitors: Walker, Martineau & Co., 36, Theobald's Road, W.C.1.

Unique Fittings, Ltd.—Private company. Registered July 25th. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers of, agents for, or dealers in electrical and other fittings, home appliances, vacuum cleaners, and other labour-saving devices. The directors are: E. J. King, Cliftonville, Victoria Road, Elland; L. F. King, 3, Rose Bank, Marlborough Road, Manningham, Bradford. K. Levell (managing director), Woodsome, Lees, Kirkburton, near Huddersfield; C. E. Hopkinson, 1, Garden Terrace, Heaton, Bradford. Registered office: St. George's Hall, Bradford.

Herbert E. Taylor & Co., Ltd.—Private company. Registered July 26th. Capital, £30,000 in £1 shares. Objects: To acquire the business of electrical engineers, fitters, motor engineers and agents, automobile coachbuilders, &c., carried on by H. E. Taylor and E. Morse as "H. E. Taylor & Co." The directors are: H. E. Taylor, Cringleford, Norwich, coachbuilder; E. Morse, Dellside, Eaton, Norwich, horticulturist. Registered office: 7, Queen Street, Norwich.

Magneto & Accumulator Co. (Birmingham), Ltd.—Private company. Registered July 27th. Capital, £1,000 in £1 shares. Objects: To acquire as from March 31st, 1928, the business of magneto and accumulator manufacturers, repairers and salesmen now carried on at 227, Broad Street, Birmingham. The directors are: C. H. Robottom (permanent director and chairman), 2, George Road, Edgbaston, Birmingham; W. J. Hollis, Bedruthen, Beech Hill Road, Wylde Green. Registered office: 227, Broad Street, Birmingham.

Official Returns of Electrical Companies.

Provincial Tramways Co., Ltd.—Capital, £275,440 in 10,000 preference shares of £10 each, and 175,440 ordinary shares of £1 each. Return dated May 1st, 1928. 10,000 preference and 124,560 ordinary shares taken up. £162,700 paid on 3,814 preference and 124,560 ordinary shares, £61,860 considered as paid on 6,186 preference shares. Mortgages and charges: £80,140.

Budleigh Salterton Electric Light & Power Co., Ltd.—Debenture dated July 17th 1928, to secure £2,000, charged on land at Budleigh Salterton, and the company's undertaking and property, present and future, including uncalled capital. Holders: Branch Nominees, Ltd. (The above debenture ranks *pari passu* with the existing debentures for £3,000 and £2,000 respectively.)

Cheap Electric Power Corporation, Ltd.—Particulars filed of two series of debentures, each for £100,000, authorised July 16th, 1928, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issues being £12,000 and £8,000 respectively.

British Insulite, Ltd.—Debenture dated July 3rd, 1928, to secure £1,000, charged on land and buildings in Belfield Road, Rochdale, and the company's undertaking and property, present and future, including uncalled capital. Holder: G. M. Hampshire, Guys Cliffe, Deganwy, Carnarvonshire.

Wood Electric Fittings Co., Ltd.—Capital, £10,000 in 5,000 8 per cent. cumulative preference and 5,000 ordinary shares of £1 each. Return dated April 21st, 1927 (filed February 17th, 1928). All shares taken up. £5,000 paid on the preference, £5,000 considered as paid on the ordinary. Mortgages and charges, nil.

W. J. Furse & Co., Ltd.—Capital, £35,000 in 9,000 cumulative preference and 26,000 ordinary shares of £1 each. Return dated April 30th, 1928. 9,000 preference and 21,029 ordinary shares taken up. £10,735 paid on 10,735 ordinary shares, £19,294 considered as paid on 9,000 preference and 10,294 ordinary shares. Mortgages and charges, nil.

Direct Spanish Telegraph Co., Ltd.—Capital, £95,000 in 13,000 ordinary and 6,000 preference shares of £5 each. Return dated May 3rd, 1928. 12,931 ordinary and 6,000 preference shares taken up. £94,655 paid. Mortgages and charges: £96,000 4½ per cent. debentures.

Camborne Electricity Supply Co., Ltd.—Capital, £20,000 in £1 shares. Return dated May 3rd, 1928. All shares taken up. £20,000 paid. Mortgages and charges, nil.

Neon Lights (1923), Ltd. (old company).—E. James, C.A., of St. Lawrence House, Trump Street, E.C.2, ceased to act as receiver or manager on July 12th, 1928.

Three Spires Electric, Ltd.—Debenture dated July 12th, 1928, to secure £700, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: F. C. Brown, 54, Kensington Road, Coventry.

Maybrook Electrical Co., Ltd.—Prior lien debenture dated July 3rd, 1928, to secure £1,000 charged on the company's undertaking and property, present and future, including uncalled capital and a sinking fund policy. Holders: H. L. Faulkner and J. S. Faulkner, 17, Warham Road, Croydon.

Bowers & Barr, Ltd.—Charge on 61, South Howard Street, Great Yarmouth, dated June 23rd, 1928, to secure £300. Holder: E. V. Barr, 11, Trafalgar Road, Great Yarmouth.

E.G.S. Co., Ltd.—Satisfaction in full on July 10th, 1928, of debentures dated September 20th, 1918, securing £6,000.

Alfred Vernon Power & Engineering Co., Ltd.—Satisfaction in full on June 30th, 1928, of debenture and collateral mortgage both dated December 15th, 1926, securing £855.

British Thomson-Houston Co., Ltd.—Capital, £4,000,000 in 2,000,000 7 per cent. cumulative preference and 2,000,000 ordinary shares of £1 each. Return dated May 16th, 1928. 1,500,000 preference and 2,000,000 ordinary shares taken up. £3,425,310 paid, £74,690 considered as paid. Mortgages and charges: £1,537,575.

R. Pain & Sons, Ltd.—Capital, £6,000 in £1 shares. Return dated May 17th, 1928. 4,304 shares taken up. £4 paid, £4,300 considered as paid. Mortgages and charges, nil.

Alert Electrical Co., Ltd.—Capital, £2,000 in £1 shares. Return dated February 28th, 1928. 708 shares taken up. £708 paid. Mortgages and charges, nil.

Wandsworth Electrical Manufacturing Co., Ltd.—Capital, £25,000 in £1 shares. Return dated May 28th, 1928. 17,230 shares taken up. £14,365 paid, £2,865 considered as paid. Mortgages and charges, nil.

Evered & Co., Ltd.—Capital, £50,000 in £1 shares. Return dated February 25th, 1928. 27,168 shares taken up. £6,393 paid, £20,775 considered as paid. Mortgages and charges: £52,526.

F. C. Brown (Electricity), Ltd.—H. M. James, Turnbulls' Chambers, 14, High Street, Coventry, ceased to act as receiver or manager on July 6th, 1928.

R. A. Howard, Ltd.—C. S. Steel, 34-6, Gresham Street, E.C., was appointed receiver and manager on July 12th, 1928, under powers contained in debentures dated December 18th, 1925.

Baxendale Bros., Ltd.—Satisfaction in full on June 14th, 1928, of debenture and second debenture dated May 11th, 1916, and November 3rd, 1916, securing £1,000 and £945 respectively.

Zone Wireless Co., Ltd.—First mortgage debenture dated June 28th, 1928, to secure £1,000 charged on the company's property and assets, present and future, including uncalled capital. Holder: W. McElroy, Iddesleigh House, Caxton Street, S.W.1.

Small's, Ltd.—Particulars filed of £200 debentures authorised July 3rd, 1928, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Burton & Tweedy, Ltd.—Satisfaction in full on March 31st, 1928, of second debenture dated February 18th, 1924, securing £1,000.

London & Provincial Radio Co., Ltd.—P. B. Settle, C.A., Market Street, Colne, was appointed receiver and manager on July 17th, 1928, under powers contained in instrument dated August 18th, 1925.

David J. Patton, Ltd.—H. J. Reed Harding, 10, Ouseley Road, Wandsworth Common, S.W., was appointed receiver on July 6th, 1928, under powers contained in debentures dated April 29th, 1926.

City Notes.

Eastern Telegraph Co., Ltd.

Sir John Denison-Pender, G.B.E. (chairman), presided at the annual meeting, on July 24th, and in presenting the report and accounts (Elec. Rev., July 20th, p. 117), said that during the period under review the company's system had been efficiently maintained and the installation of the regenerator, to which he had referred at the last meeting, had been completed on all the main line circuits. The direct circuit between London and Bombay was awaiting the completion of the underground lines between Suez and Port Said; that was expected within the next few weeks. Then, with the two new cables laid between Alexandria and Port Said during the year, the regenerator would be working between Electra House and Bombay. These and other improvements had resulted in greater speed and efficiency with a smaller staff. Palestine had now been joined up with the main line system, *via* Cyprus. The Turkish concession had been duly ratified, and direct communication with Turkey was re-established in November last. Further reductions had been made in the rates to South Africa and India, in addition to those in the Australian and New Zealand rates made in the preceding year. They had closed unremunerative stations and proposed to dispense with two cable ships in the interests of economy. The company had now been in existence for 97 years, and the policy of reasonable dividends and of building up the reserves had enabled them to consistently reduce their rates. In 1902 they first encountered Government competition, and last year the "beam" radio system was established for communication with Australia, South Africa, and India. In spite of that the company continued to carry more traffic than the radio system, and it was clear that the cables still held a definite and important position in the world's communications. At the same time, they could not afford to lose the traffic which the cheaper radio service was taking from them. That meeting had been deferred in the hope that the directors would be able to announce something definite with regard to the negotiations with the Government and the merger with the Marconi Co. The matter was, however, still in the hands of the Government, and he could say no more than that the report of the Imperial Wireless and Cable Conference was unanimous. He had every hope that in the near future they would be able to announce a satisfactory conclusion to the negotiations. In anticipation of that and in order to complete the scheme, they had purchased the controlling interest in the Direct West India Cable Co., which, in turn, controlled the Cuba Submarine Telegraph Co., the Halifax & Bermudas Cable Co., and the West India and Panama Telegraph Co. The group owned 8,000 miles of cable, 22 cable stations, and two wireless stations. Those companies would eventually be brought in under the merger, and so complete the whole system of cables and radio in the West

Indies, both owned and controlled by the British Government or by British companies. In conclusion, Sir John said that if the anxious time through which they had passed resulted in the formation of a merger company, comprising the whole of the overseas telegraphic communications of the Empire, while maintaining connection with foreign countries, with suitable protection for the public in the matter of rates, and a reasonable return on the invested money, coupled with an unsurpassed mobility and efficiency, one of the greatest advances in British commercial enterprise would have been achieved.

Eastern Extension, Australasia and China Telegraph Co., Ltd.

The annual meeting was held on July 26th, Sir John Denison-Pender, G.B.E. (chairman), presiding. In the course of his speech the chairman mentioned the death of Mr. G. C. Jack, who had served the company for fifty-one years, and for thirty-seven years had been its accountant, and said that Mr. E. H. Adye had been appointed as his successor. Dealing with the accounts (*vide* our issue of July 20th, p. 117), he said that the amount carried forward had been increased in view of possible contingencies in connection with the proposed merging of the radio and cable interests. The loan to the Chinese Board of Communications had been reduced during the year by £13,990, and it was hoped that the total would be fully liquidated by December 31st, 1930. Cable tariffs to Australia were reduced in February, 1927, and "beam" wireless to Australia was commenced in April, 1927. The result of the year's work had been satisfactory, and there had since been further improvement. Negotiations had for some years past been in progress between the Chinese Telegraph Administration and the Great Northern Telegraph Company and their own company. It had not been possible to arrive at an understanding, owing to the Peking Telegraph Administration not having jurisdiction over the various other telegraph administrations which had come into being during the past years of turmoil. Now there appeared to be some prospect of the telegraph affairs of that country coming under a more unified control. In conclusion, the chairman referred the shareholders to his speech at the meeting of the Eastern Telegraph Co., Ltd., which is reported above.

Victoria Falls and Transvaal Power Co., Ltd.

This company's report for 1927 was reviewed in our issue of July 20th (p. 117). The Marquess of Winchester (chairman) presided at the annual meeting on July 26th, and in the course of his speech said that the first debentures had been reduced during the year by £150,000 and the second debentures by £79,800, leaving outstanding amounts of £1,200,000 and £812,540, respectively, at the end of the year. The outstanding amount shown in connection with the Witbank undertaking had been practically repaid by the Electricity Supply Commission of South Africa, but as they were now extending the station on behalf of the Commission the amount would tend to increase temporarily. Although the full reduction of prices operated during the year, there was a record net profit, and they had again been able to pay the full 10 per cent. on the preference shares and 15 per cent. on the ordinary shares. The sales of energy had increased by over 34 million kWh. They had received further applications for power, and further load was likely to materialise. The power requirements of the Rand mining industry were almost entirely dependent upon the native labour force available. They accordingly viewed with anxiety the signing of a draft convention providing for a gradual reduction in the number of natives recruited from Mozambique for employment in the Transvaal. It was hoped to secure such alterations as would ensure, at least, that the existing labour force would be maintained. It was expected that they could look forward to a continuance of activity on the Witwatersrand for many years, and it was more than probable, provided labour was available, that the demand for power would continue to show an upward tendency. The new 20,000-kW set at Vereeniging had been put into operation, and early next year the 20,000-kW extension of the Witbank station was expected to be in commission. Those machines would be required to handle the load to be met when they came into service, and investigations of the mining industry showed that the demand would increase beyond the capacity of the plant at present projected. The position was being closely studied, and the reinvestment in the business of a considerable amount of the sums reserved for depreciation and renewals would shortly have to be decided upon. Last year he had mentioned the position which had arisen in connection with the views of the Northern Rhodesian Government regarding the rights in that colony, particularly as concerned the Victoria Falls. They were in negotiation with the Government in an endeavour to reach an agreement which would be more suitable for the establishment of a power undertaking at the Falls than under the conditions of the original concession drawn up over 30 years ago, and one which would be mutually satisfactory to both parties. The directors had accepted a satisfactory offer for the company's holding in the Coronation Collieries, Ltd. In conclusion, the chairman paid a tribute to the staff, making special reference to Mr. Bernard Price, who was appointed general manager and chief engineer in South Africa last year.

Berry's Electric (1928), Ltd.

This company, which was formed recently to take over the business of Berry's Electric, Ltd., published this week, for information only, particulars of an issue of £100,000 of 7½ per cent., 20-year cumulative convertible notes at par. The statement showed that Mr. H. H. Berry (the chairman) commenced business in 1897 and patented and manufactured special forms of switchgear and accessories. In 1917 Mr. Berry transferred the goodwill and assets of his business to Berry's Electric, Ltd., and subsequently invented the "Magicoal" fire, the sales of which have shown great progress. The net profits of Berry's Electric, Ltd., before providing for loan interest and income tax, are given as follows: Year ended December 31st, 1924, £9,688; 15 months ended March 31st, 1926, £23,483; year ended March 31st, 1927; £31,742; year ended March 31st, 1928, £32,686. The old company's net assets are valued at £149,707 (after deducting £12,230 for sundry creditors. The new company's capital is £225,000 in 10s. ordinary shares and the purchase consideration is £215,000 (£75,000 in cash and the balance in shares in the new company). Of the purchase price, the sum of £65,293 is allocated to goodwill (including patents, on which no separate value is placed). The new company undertakes to satisfy all debts and liabilities of the old company as at March 31st last, and will be entitled to all profits since that date. Mr. H. H. Berry is permanent chairman subject to his holding shares to the nominal value of not less than £50,000. It is noted in the statement that, apart from the shares issued to the vendors, 1,007 shares were issued for cash at par on July 12th. The new company's borrowing powers are unlimited. The other directors of the company are Messrs. P. D. Morton, A. Shelton and W. J. Markham, all directors of Berry's Electric, Ltd., and Mr. G. J. Berry, electrical engineer.

Burndept Wireless, Ltd.

At extraordinary meetings of shareholders on July 25th it was decided to place the company in voluntary liquidation and to form a new company, Burndept Wireless (1928), Ltd., in accordance with the scheme drawn up by the board (*vide* our last issue, p. 164). Mr. T. Barson, chairman of the shareholders' committee, reviewed the work of that committee, and stated that economies had been initiated which had enabled the receiver and manager to earn some profit. They were convinced that if the company went into liquidation there would be nothing at all for the shareholders. Under the scheme proposed, after allotments had been made to the present shareholders there would be nearly 200,000 5s. shares available for future issue, and half of these would be taken up at once if the underwriters exercised their option upon 100,000. It was not proposed that the new board would include any of the directors of the old company, but it was felt that it would be desirable for the shareholders' committee to be represented. Mr. Rooke, who would be chairman of the new company, had asked him (Mr. Barson) to join the board. He would be pleased to accept the invitation if it was the shareholders' wish, and he approved the constitution of the new board. The scheme was approved.

Stock Exchange Notices.

Dealings in the following have been specially allowed by the Committee under Rule 159:—

Bermuda Traction, Ltd.—125,000 ordinary shares of £1 each fully paid, Nos. 1 to 125,000.

Fife Tramway, Light & Power Co., Ltd.—£150,000 5½ per cent. five-year registered notes, Series "B," fully paid.

Marconi's Wireless Telegraph Co., Ltd.—1,195 ordinary shares of £1 each fully paid, Nos. 3,247,626 to 3,248,820.

The undermentioned have been ordered to be officially quoted:—

American Telephone and Telegraph.—$3,745,000 capital stock.

Bournemouth and Poole Electricity Supply.—360,000 ordinary shares of £1 each, fully-paid, Nos. 800,001 to 1,160,000.

W. & T. Avery, Ltd.

Sir J. Fortescue Flannery, Bt. (chairman) presided at the annual meeting on July 24th, and in the course of his speech referred to the allotment of bonus shares and to the knighthood conferred upon the managing director, Sir Gilbert Vyle. Dealing with the scope of the company's activities, he said that they now made all kinds of weighing machines, from those capable of dealing with heavy loaded trucks to those for weighing gossamer threads or cotton or wool yarn to determine its condition for weaving as well as its quantity. Five Continental factories were manufacturing to Avery designs, and the company had opened a branch in Canada.

Richard Johnson & Nephew, Ltd.

The statutory meeting of this company was held on July 24th, Major E. Johnson (chairman) presiding. The chairman pointed out that the original firm was founded over 150 years ago, although in the eyes of the law the company was a new-born baby. It appeared as though the profits from March 31st to May 24th, the date of the company's incorporation, would be satisfactory, and would give additional financial strength to the company. The use of wire was ever expanding; the electrical industry was a large consumer, and it was anticipated that the large schemes now being put in hand would create a greater and further demand for the company's products.

Mexican Power and Tramway Companies.

The annual meetings of the Mexican Light & Power Co., Ltd., and the Mexico Tramways Co. were held in Toronto on July 24th. Referring to the assassination of General Obregon, the chairman said that their relations with him had always been satisfactory; the probable effect of his death upon the companies' business could not yet be judged; in the past the companies had emerged successfully from many political crises. Good progress had been made with the Lerma Dam, and the first stone had been laid by President Calles, who expressed his good feelings towards the companies. The Toluca Light & Power Co., which served that city and a mining area, had been acquired; the business was capable of considerable expansion. In spite of the depressed conditions in Mexico the net earnings of both companies had shown satisfactory increases.

Yorkshire Electric Power Co.

The report of the directors for the half-year ended June 30th last announces that interim dividends at the rate of 6 per cent. per annum have been declared on the preference and ordinary shares issued prior to 1928. In February last an issue of 897,000 ordinary shares to existing shareholders at 24s. per share was very largely over-subscribed. The company's output continues to grow despite trade depression and the special difficulties of the coal industry. Economies are being effected by the increasing use of the Ferrybridge station and the lower price of coal has enabled the company to further reduce its charges. Applications have been made to the Electricity Commissioners for powers to supply electricity in parts of the counties of Derby, Lincoln, Nottingham, and the East Riding, which adjoin the present area of supply. Mr. G. H. Peake has been appointed deputy-chairman of the company.

Electrical Distribution of Yorkshire, Ltd.

The half-yearly report to June 30th last states that an interim dividend at the rate of 9 per cent. per annum has been declared. Further progress in the number of consumers is reported and reduction in charges have been made. The Special Orders for a number of parishes in the Skipton rural district and Ansthorpe (Tadcaster) have been confirmed by Parliament. Meetings of shareholders are to be called in the autumn to authorise an increase in the company's capital.

Ebonite Container Co., Ltd.

Last week this company, in conformance with the regulations of the Stock Exchange Committee, published details of its constitution and objects. It has an authorised share capital of £60,000 in 300,000 4s. shares, of which 250,000 have been issued. The company holds an exclusive licence for Great Britain under certain patents for the manufacturing of accumulator cases, &c. Among recent orders received is one from a well-known accumulator manufacturer covering twelve months' requirements.

Oswestry Electric Lighting and Power Co., Ltd.

The report for the year ended December 31st last showed a profit of £946, to which was added £568 brought forward, making £1,523. A dividend of 8 per cent. has been declared on the ordinary shares, and £300 has been put to reserve, leaving £743 to be carried forward. During the year the company installed a 100-kW rotary convertor, &c., and is now taking a part of its supply in bulk from the North Wales Power Co., Ltd.

Atlas Light and Power Co., Ltd.

An extraordinary general meeting was to be held yesterday (Thursday) to consider resolutions providing for the creation of 1,000,000 shares of £1 each, raising the capital to £6,500,000, and for the issue of these as preference or ordinary shares. In a letter to the shareholders, the directors said that the new capital would be needed from time to time to finance the extension of the company's South American undertakings and the acquisition of new businesses.

Parkinson & W. B. Cowan, Ltd.

A final dividend of 7½ per cent. on the ordinary shares maintains the distribution for the year at 10 per cent. The reserve receives £17,500 (against £17,386), £1,585 (against £2,079) is allocated to depreciation, and £27,176 is carried forward. It is proposed to change the name of the company to "Parkinson & Cowan, Ltd."

Western Union Telegraph Co.

The earnings report for the first half of the current year shows gross revenues of $67,066,225, as compared with $65,961,326 for the first six months of 1927. After deducting expenses and interest on bonded debt, there is a net income of $7,278,705, against $7,322,086.

Metropolitan Railway Co.

The interim dividend on the ordinary stock is raised from 1 to 1½ per cent., while the distribution on the Surplus Lands stock remains at 1½ per cent.

Bristol Tramways and Carriage Co., Ltd.

The directors have declared an interim dividend of 3 per cent. on the ordinary shares for the half-year ended June 30th.

Cable, Telephone and General Trust, Ltd.

The dividends in respect of the half-year ended June 30th have been declared on the 6 per cent. cumulative and 7 per cent. non-cumulative preference shares.

Charing Cross Electricity Supply Co., Ltd.

An interim dividend of 9½d. per share has been declared on the ordinary shares of the West End undertakings, as last year.

South Metropolitan Electric Light and Power Co., Ltd.

A dividend at the rate of 6 per cent. per annum has been declared on the ordinary shares, as last year.

French Companies.

The *Compagnie Française des Câbles Télégraphiques* is paying a dividend of 43.17 fr. per ordinary share out of net profits of 6,161,000 fr. for 1927.

The *Compagnie Générale de Télégraphie sans Fil* reports net profits of 9,209,000 fr. for 1927. The dividends are 50 fr. per "B" and 25 fr. per "A" share.

Stocks and Shares.

Stock Exchange Activities.

MONDAY EVENING.

AT the beginning of August, the Stock Exchange does not expect to be busy, and, all things considered, the volume of trade which is being transacted in many of the markets is above the average for this time of year. A keen interest remains centred around the matters connected with the Eastern cable quartette and the Marconi issues, while the declaration of their interim dividends by the Home railway companies is another factor which compels attention to Stock Exchange markets and to the course of trade in the country. In the industrial section, there is not much going on, and the flood of new issues, such a feature of the last few months, shows a marked diminution, thereby ensuring to the existing concerns a greater measure of attention than they receive when so much competition comes from newer companies.

Home Rails.

The Metropolitan Railway has declared an interim dividend of 1½ per cent., as against 1 per cent. a year ago. The interim dividend on the Surplus Lands stock remains at 1½ per cent. For the whole of last year, the Metropolitan paid 3 per cent., and it is hoped that the present increase foreshadows a dividend of, at any rate, 3½ per cent. for 1928. It should be observed that the electric railway stocks stand out with sharp prominence in their prices of to-day, as compared with those of a year ago, when these are matched against the same set of comparisons made in the case of steam stocks. The latter have fallen very heavily indeed, but Metropolitans and Underground Electric income bonds have risen 13¼, 11¼, and 22½ points respectively during the twelve months. The £1 shares of the Underground Company have come up from 19s a year ago to 26s 6d to-day. On the week, the changes are insignificant: Districts have recovered the dividend deduction. Steam stocks enjoyed substantial rises on the wages reduction agreement.

Marconis.

Marconis have been a lively market, with a rise at one time to 67s 6d. Selling reduced the price to 65s., but the £1 shares are a little better at 5½. There is still much division of opinion as to what the actual position of these £1 shares is. The opinions of counsel are quoted in support of the statement that each £1 Marconi ordinary share is equivalent to two 10s. ordinary shares, not only with regard to dividend, but also with regard to capital rights. Were there to be no doubt upon the point, it is reasonable to suppose that the price of the £1 shares would be exactly double that of the 10s. shares, and the fact of the latter being quoted at 65s. against 5½ for the £1 shares, strongly suggests that there is either a snag, or a very considerable uncertainty existing on the point.

Cable Conference Report.

The official report of the Imperial Wireless & Cable Conference follows closely upon the estimates which had been foreshadowed in advance. Indeed, as far back as March, the broad outlines were fairly well known, and the case is one of those in which the efforts made to preserve secrecy regarding the details do not appear to have been very successful. The market in Eastern Telegraphs, Eastern Extensions, Globes and Western Telegraphs, remains very firm. Further gains have been secured, Eastern putting on 3 points, and each company's shares rising 5s. apiece.

The Conference proposes that there shall be two companies formed, one a large holding concern, with a capital of nearly 54 millions sterling, to take over the assets of the existing cable and wireless companies, and the other to be called the Communications Company, to which the Government would lease its beam system. The two boards are to be alike, but

the Report proposes that two of the directors should be persons approved by H.M. Government. An advisory committee is suggested for the purpose of having a say in the matter of controlling rates. The details, meeting general anticipation, served to emphasise the feeling of satisfaction that had been previously expressed in the rises which have occurred in the stocks. The matter will have come before Parliament on Thursday in this week. The attitude of the Labour party will be closely watched, but little doubt is expressed as to the practical certainty of the scheme being adopted, with perhaps a few modifications that will be advanced in Parliament. On paper, the stocks of the cable companies under the new arrangement look rather more attractive than the shares of the Marconi Company, though the latter have the advantage of being a more popular medium of speculative interest, which, in this case, is of advantage.

Atlas Power New Capital.

Atlas Light and Power shares are a little lower at 18s 9d., although the 7 per cent. preference have not moved from 22s., on the directors' plan for increasing the capital of the company by one million pounds, which would have the effect of bringing up the nominal total to £6,500,000. The shareholders are asked to give their sanction to the new capital, which it is proposed shall be issued either as ordinary or preference, though the ultimate allocation of fifty-fifty between the two classes is to be preserved. If a new issue is contemplated in the near future, it would appear as though only preference would be offered, unless the price of the ordinary were to improve above the par value of 20s. The fresh money is required to enable the company to take advantage of opportunities for acquiring new enterprises. The company is, of course, a holding concern, with substantial interests in utility undertakings in Cordoba, Sante. Fé, Montevideo and elsewhere.

Newcomers.

Particulars are published this week of Berry's Electric (1928), Limited, a company formed to acquire the electrical apparatus and appliance business of the same name. The share capital is £225,000, divided into 450,000 ordinary shares of 10s each. It is expected that there will be a market made in the shares within the course of the next few days. Two new companies are also being formed in New York State, on lines very similar to those proposed by the cable and wireless merger on this side. One is to be called the International Communications Corporation, and the other the International Cables Corporation, both being sponsored, according to rumour, by the International Telegraph and Telephone Corporation, the object being to lay the foundations of a world-wide communication service.

Foreign Utilities.

A decision has been given recently in an action that was brought by the Belgian holders of Rio Tramway bonds for compelling the company to pay interest on the bond coupons, on the basis of gold instead of paper currency. The Judge held that the company could only be held to pay the face value of the coupons, and he failed to find any promise to pay gold or silver, either on the coupons, on the bonds, or the trust deed. The only promise was that a fixed rate should be paid, which was rescinded later by the directors. Rio Tramway first mortgage fives stand at 98½, and the five per cent. 50-year mortgage bonds at 92. Hydro-Electrics rose to 30½ before relapsing to 28 on reports of financial trouble in Brussels. International Holdings gave way to 13, for the same reason. Mexican Light and Power 7 per cent. preferred shares have fallen 2½ to 77½: other Mexican shares remain steady. The chairman, at the meeting held in Toronto last week, said that in the past, other political crises had been gone through without the serious detrimental effects which might have been expected. He referred to the jitney business as appearing to be on the decline, and his statement ran on the lines of cheerful expectations. The company's second preference shares are better at 2½. Shawinigan common rose to 92. Tokyo Electric new scrip hardened to 3¼ premium.

Electricity Supply.

Home electricity supply shares are very firm, without showing particular movement. Scottish Power are an outstanding feature of strength, the price being 1s up at 31s. 6d., which had a corresponding effect upon the new shares, where the premium has advanced to 4s. 3d. Newcastle-on-Tyne ordinary are dull at 25s, and Electric Supply Corporation dropped 2s. 6d. to 24s. 6d. The South Metropolitan Electric Light Company has declared interim dividends on its preference shares, and at the rate of 6 per cent. per annum on the ordinary, at the same rates as those of last year. Yorkshire Electrics are harder at 34s. 6d. ex dividend. Yorkshire (West Riding) Trams have fallen 2s. 6d. to 5s.

Manufacturing and other Shares.

Henleys have gone back to 5¼, and General Electrics to 38s. 3d. Brush are 6d. lower at 28s. 3d. Rumour is again busy in the manufacturing and equipment section, linking the names of several companies in possible amalgamation. The gossip is not reflected in any of this week's movements of prices. Babcocks keep firm at 3¾; other such shares change seldom and narrowly. The rubber market shows no pronounced disposition one way or the other.

Share List of Electrical Companies.

Home Electricity Companies.

	Nom. £	Dividend. 1926.	Dividend. 1927.	Price July 30, 1928.	Rise or fall.	Yield. p.c.
Bournemouth and Poole	1	14†	15	3⅞	—	... ...
Brompton Ordinary	1	8¾	8½	26/6	—	5 5 8
Charing Cross Ordinary	1	8½	8½	27/-	—	5 8 8
do. do. 4½% Pref. ...	1	4½	4½	17/6	—	5 2 10
Chelsea	1	8¾	8¾	26/6	—	5 5 8
City of London	1	10	10	30/9	—	4 11 1
do. do. 6% Pref.	1	6	6	22/-	—	5 4 4
Clyde Valley	1	8	8	37/-	—	4 6 3
County of London	1	7½	7½	38/-	—	3 19 0
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Edmundsons' 7% Pref.	1	7	7	25/6	—	5 9 10
Elec. Supply Corporation	1	11	11	47/6	—½	4 12 7
Kensington Ordinary	1	8	8	26/6xd	—	5 5 8
Lancs. Light and Power	1	7½	7½	29/-	—	5 3 5
London Electric	1	8½	8½	27/-	—	5 3 8
Metropolitan	1	8	9	28	—	3 16 0
do. 4½% Pref.	1	4½	4½	17/6	—	5 2 10
Midland Counties	1	6	6½	30/-	—	4 6 8
Mid. Elec. Power	1	—	15	39/3	—	... ...
Newcastle-on-Tyne Ordinary ...	1	5	6	25/-	—9d.	4 16 0
do. 7% Pref. ...	1	7	7	26/6	—	5 5 8
Notting Hill 6% Pref.	10	6	6	10½	—	5 11 7
North Met. Elec. 6% Pref.	1	6	6	23/-	—	5 4 4
St. James' and Pall Mall	5	8	8	27/6xd	—	5 1 10
Scottish Power	1	8	8	31/6	+1/-	5 1 7
South London	1	8½	8½	26/6	—	5 5 8
Urban Ordinary	1	7	7	31/3	—	... ...
Westminster Ordinary	1	8½	8½	27/6	—	5 1 10
Whitehall Elec. Invst. 7½% Pref. ...	1	7½	7½	23/9	—	6 6 4
Yorkshire Elec.	1	8	8	34/6xd	+6d.	4 12 9

Home Rails.

Central London Ord. Assented ...	Stock	4	4	78	—	5 9 7
Metropolitan	,,	8	8	67½	—½	4 9 0
do. District	,,	3½	4	75½xd	+2	5 6 0
Underground Electric	£1	1½	5	25/6xd	—	3 18 5
do. do. Income ...	Bonds	6	6	124	—	4 16 9

Telegraphs and Telephones.

Anglo-Am. Tel. Pref.	Stock	6	6	101½	+1	5 18 5
do Def.	,,	1½	1½	24	—	6 5 0
Automatic Telephone	1	10	10	42/9	—	4 9 0
Eastern Extension	10	10	10	25½	+½	*3 19 2
Eastern Tel. Ord.	Stock	10	10	253	+3	*3 19 0
Globe Tel. and T. Ord.	10	10	10	25	+½	*4 0 0
do. do. Pref.	10	6	6	11½	+¼	5 7 10
Great Northern Tel.	10	20	20	38½	—	5 4 0
Indo-European	25	10	10	45½	—	*5 10 0
Marconi	10/-	5	*10	65/-xd	+9d.	... ...
Marconi-Marine	1	8½	12½	50/-	—	5 0 0
Oriental Telephone Ord.	1	12	12	53/9	—	*4 9 3
United R. Plate Tel.	5	8	8	9½	—½	*4 2 1
Western Telegraph	10	10	10	25½	+½	3 19 2

*Interim.

Home and Foreign Trams, &c.

Anglo-Arg. Trams First Pref. ...	5	5½	5½	3⅝	—	7 11 9
do. do. 2nd Pref. ...	5	6	6	3½	—	8 2 8
do. do. 5% Deb. ...	Stock	5	5	77½	+1½	6 9 0
British Electric Traction Def. Ord.	,,	—	—	220	+20	... ...
do. do. Pref. Ord.	,,	8	7½	125	+½	6 0 0
Brazil Traction	100	6	7	56½xd	—	3 19 8
Brit. Columbia Elec. Rly. Pcc. ...	Stock	5	5	96½	—	5 8 9
London & Sub. Trac. 5% Pref. ...	1	Nil	Nil	9/6	—	... ...
London United Tram Deb. ...	Stock	4	4	60½	—	6 13 3
Mexico Trams, 5% Bonds	—	5	5	81	—	6 3 3
Mexican Light Common	100	Nil	Nil	71	—	... ...
do. 7% Pref...	100	Nil	7	77½	—2½	9 0 8
do. 1st Bonds	—	5	5	89½	—	6 1 3
Yorkshire (West Riding)	1	Nil	Nil	5/-	—¼	... ...

Manufacturing Companies.

Babcock & Wilcox	1	12	15	67/3	—	*4 9 0
British Aluminium Ord.	1	10	10	45/-	—	*4 9 0
British Elec. Transformer Pref. ...	1	7	7	18/-	—	7 15 0
British Insulated Ord.	1	15	15	4¼	—	3 10 6
Brush Ord.	1	10	10	28/3	—6d.	7 2 10
Callenders	1	15	15	4⅞	—	3 10 6
do. 6½% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Parkinson Pref. Ord. ...	1	—	6	17/6xd	+6d.	6 17 2
do. 8% Pref.	1	—	8	26/3	—	6 2 0
Edison-Swan	4/-	10	10	12/6	—	8 4 0
do. 5% Deb.	Stock	5	5	88	—	5 13 3
Electric Construction	1	7½	7½	27/6	—	5 9 1
Enfield Cable Pref.	1	7½	7½	26/3	—	5 14 3
English Electric	1	Nil	Nil	8/-	—	... ...
do. do. Pref.	1	8	Nil	10/-	—	... ...
Gen. Elec. Pref.	1	6½	6½	24/6	—	5 6 1
do. Ord.	1	7½	10	38/6	—9d.	5 4 0
Henley	1	25	25	52	—3	4 7 0
do. 4½% Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber	1	Nil	Nil	13/9	—	... ...
Johnson & Phillips	1	12½	10	2	—	5 0 0
Met.-Vickers Ord.	1	8	8	30/9	—	5 18 1
do. Pref.	2	8	8	2⅜	—	6 1 11
Siemens Ord.	1	7½	7½	27/6	—	5 9 1
Telegraph Construction	12	10	10	25	—	*4 16 2

* Dividends paid free of Income Tax.
† 4% of which was Tax Free.

The Electrical Imports of Peru.

Figures for 1925 and 1926 Compared.

THE following figures show the values of the imports into Peru of electrical goods and apparatus in 1926. Comparative figures for 1925 are also given, together with a note of increases or decreases. The Peruvian £ = about 20s.

	1925. £P	1926. £P	Inc. or dec. £P
Electrical accessories, e.g., switches, cutouts, plugs, lampholders—			
Total	33,000	22,500	−10,500
From Germany	22,000	9,500	−12,500
„ Great Britain	1,000	1,100	+ 100
„ United States	8,000	9,500	+ 1,500
Accumulators and batteries—			
Total	15,000	17,700	+ 2,700
From Germany	1,000	1,300	+ 300
„ United States	13,000	14,000	+ 1,000
Insulators and tubes—			
Total	29,000	30,000	+ 1,000
From Germany	11,000	3,000	− 8,000
„ United States	8,000	21,000	+13,000
„ Great Britain	1,000	3,700	+ 2,700
Copper wire, covered, except with silk, up to 3 mm. in diam.—			
Total	24,000	16,000	− 8,000
From Germany	11,000	5,000	− 6,000
„ United States	10,000	7,000	− 3,000
„ Great Britain	1,400	2,400	+ 1,000
Ditto more than 3 mm. in diam.—			
Total	15,300	18,600	+ 3,300
From Germany	3,500	2,700	− 800
„ United States	9,500	11,000	+ 1,500
„ Great Britain	1,700	1,600	− 100
„ Italy	400	2,700	+ 2,300
Telegraph apparatus, including wireless—			
Total	11,700	11,400	− 300
From United States	1,800	1,500	− 300
„ Great Britain	9,600	9,200	− 400
Telephone apparatus—			
Total	6,500	6,300	− 200
From United States	1,500	2,700	+ 1,200
„ Great Britain	2,500	800	− 1,700
Lighting fittings—			
Total	22,700	14,100	− 8,600
From Germany	12,800	6,900	− 5,900
„ United States	3,400	1,800	− 1,600
„ France	1,900	2,100	+ 200
Heating and cooking apparatus—			
Total	3,600	2,400	− 1,200
From Germany	900	1,100	+ 200
„ United States	1,900	1,000	− 900
Cables, copper—			
Total	56,600	72,000	+15,400
From Germany	6,700	6,000	− 700
„ United States	3,500	30,000	+26,500
„ Italy	14,400	6,800	− 7,600
„ Great Britain	24,000	19,000	− 5,000
Electric bells—			
Total	500	800	+ 300
Insulating tape—			
Total	2,300	1,700	− 600
Covered copper flex—			
Total	14,300	7,000	− 7,300
From Germany	8,600	4,200	− 4,400
„ United States	1,100	400	− 700
„ Belgium	700	1,300	+ 600
Meters and instruments—			
Total	4,600	5,200	+ 600
From Germany	2,200	1,900	− 300
„ United States	2,000	2,700	+ 700
Metal filament lamps—			
Total	35,900	29,000	− 6,900
From Germany	14,900	12,700	− 2,200
„ United States	6,800	9,300	+ 2,500
„ Holland	13,000	4,500	− 8,500
Magnetos—			
Total	2,300	1,700	− 600
From Germany	800	1,100	+ 300
„ United States	1,100	600	− 500
Electric light meters, domestic—			
Total	600	1,800	+ 1,200
From Germany	300	1,100	+ 800
Motors up to 1 h.p.—			
Total	2,600	2,000	− 600
Switchboards—			
Total	17,000	13,000	− 4,000
From Germany	2,600	3,400	+ 800
„ United States	12,100	8,000	− 4,100
„ Great Britain	800	300	− 500
Fans—			
Total	700	2,600	+ 1,900
From Germany	100	700	+ 600
„ United States	300	900	+ 600
„ Italy	200	500	+ 300
Current transformers—			
Total	32,300	21,000	−11,300
From Germany	1,400	3,000	+ 1,600
„ United States	20,600	16,000	− 4,600
„ Great Britain	3,500	800	− 2,700
Total of electrical goods and apparatus	373,000	334,000	−39,000
From Germany	108,000	70,000	−38,000
„ United States	132,000	166,000	+34,000
„ Great Britain	61,000	48,000	−13,000
„ Italy	37,000	21,000	−16,000

Economic Conditions in Portugal.

Recent Developments.

MR. LEONARD H. LEACH, British Vice-Consul at Lisbon, has prepared a report bearing this title for the Department of Overseas Trade (Stationery Office, 1s. 6d. net). In his introduction, Mr. Leach deals with the political situation which, at the date of the report (March last) appeared to be calm with a tendency to assume a more constitutional aspect. Trade has been hampered by difficulties in the exchange market. Export trade has been greatly prejudiced by the maintenance of the regulations by which the Government appropriates the proceeds of all sales abroad, returning 75 per cent. thereof to the exporter in escudos at the official rate, and only allowing him to re-purchase 25 per cent. of the foreign currency resulting from his transaction. This procedure partakes of the nature of an export tax. The 1926 statistics show that Great Britain's share of the import trade was seriously reduced as a consequence of the coal stoppage. British firms have been successful in securing a number of important public works contracts recently and the British prices, in general, are on a competitive level with Continental tenders, and frequently below them.

The Douro Power Scheme.

In August, 1927, an agreement was arrived at between the Portuguese and Spanish Governments for the division of the power available from the River Douro in the international zone. Under this arrangement it is calculated that a minimum of 285,000 h.p. will be available for Portugal and 339,000 h.p. for Spain, the difference in favour of the latter being offset by the extra cost which will be incurred in the construction of reservoirs in the upper part of the river from which Portugal will derive benefit. A Spanish-controlled company, the Sociedad Hespano-Portuguesa de Transportes Electricos, has already obtained the concession for the Spanish territory, and is understood to be interested in obtaining that for the Portuguese zone, but no arrangement has yet been made, so far as is known, with regard to the latter, so that the concession for the improvement and development work involved still remains open. The carrying-out of this scheme is expected to have a far-reaching effect upon the economic position of the country.

Another water-power scheme which is under consideration is the development of the Cabril falls near Thomar. A Belgian company is concerned, and it has projected the electrification of the railway from Entron Camento to Lisbon in connection with the scheme. It is estimated that the proposed preliminary works at Cabril will yield 39,000 h.p.

Railways and Tramways.

The electrification of the local line from Lisbon to Cascaes was completed in 1926 and the service has run efficiently and satisfactorily since then. The improvement is of great importance in connection with the development of the Estoril district as a tourist resort. The contract for the electrification was given to a Belgian company and the work was actually carried out by a German firm on account of Belgian reparations. The British company which controls the efficient Lisbon tramway service has embarked upon an extensive development programme, which is making good progress.

Radio and Telephone Development.

The " beam " radio station of Monsanto has been in operation for a year, and stations have been erected at the Azores,

Madeira, Cape Verde Islands, Loando and Lourenço Marques. The Portuguese system is directly linked up with the other main radio systems, and so is available for communication with all parts of the world. The operating company, the Cia. Portuguesa Radio Marconi, which is affiliated with the British Marconi Co., was formed in 1925 to take over from the Portuguese Government the concession for international radio communication for Portugal for a period of 40 years.

In January last a contract was signed between the Government and the Anglo-Portuguese Telephone Co. for a renewal of that company's concession for the telephone systems in Lisbon and Oporto. The contract covers a minimum period of 40 years with the possibility of extension to 75 years. The Government has under consideration proposals by other interests to take over the Government telephone system and develop the service throughout the whole of Portugal.

The Hydro-Electric Power Commission of Ontario.

Some Extracts from the Annual Report for 1927.

THE twentieth annual report of this Commission, covering the year ended October 31st, 1927, has come to hand. It is a volume of over 400 pages, in which the construction work during the year and operating results are dealt with in exhaustive detail.

In his introductory letter to the Lieut.-Governor of Ontario, the chairman of the Commission (Mr. C. A. Magrath) states that the Commission produces power from 20 hydro-electric plants, supplemented by purchased power. He points out that the Commission's aim is to supply electricity at the minimum cost consistent with the maintenance of financial stability and shows that whereas in the United States the average cost of electricity to the domestic user is 7 cents per kWh, in Ontario the average cost of the same service is only 2 cents per kWh. The maximum demand (20-minute) rose from 947,890 h.p. in December, 1926, to 1,000,252 h.p. in December, 1927.

The total investment of the Commission in power undertakings and electric railways is $204,372,067, and the investment of the municipalities which it serves, in distributing systems and other assets, is $81,792,678, making a total investment of $286,164,745. The total revenue derived from this investment in 1927 was $34,056,708. The Niagara System is preponderantly the most important of the eight systems which the Commission operates, representing an investment of $157,273,133, over 70 per cent. of the Commission's total. The two systems next in importance are the Central Ontario and Trent System ($14,260,456) and the Thunder Bay System ($14,144,680).

The revenue during the year under review included $22,331,701 from electricity supply, of which the Niagara System and Niagara rural lines and rural power districts provided $17,594,622, about 79 per cent. The revenue obtained from consumers was more than sufficient to meet the full cost of generating and transmitting energy, as well as to provide for all operating expenses and the fixed charges of the municipal utility equipments. After meeting all charges from the $22,331,701 collected from the municipalities there was a net surplus of $534,197.

During the past two or three years very substantial progress has been made in the field of rural electrification. Practically all rural service is now given through rural power districts, which are operated directly by the Commission. There is now more than $5,200,000 invested in the rural power systems established by the Commission, and about half of this cost has been provided by the Provincial Government in pursuance of its policy of promoting agriculture. About 2,850 miles of transmission lines have been constructed, of which 910 miles were constructed during the past year. The number of consumers in these rural systems is about 25,000. Upon the working of the systems there was a net surplus of $143,618, only the Ottawa System showing a deficit. The total reserves of the Commission and the municipalities for sinking fund, renewals, contingencies and insurance purposes amount to $65,533,186.

In the section of the report dealing with operation it is stated that the operation of all systems was unusually free from interruptions as a result of lightning, &c., and weather conditions were very favourable both as regarded storms and precipitation. No additional generating stations or generators were put into operation during the year, and the natural growth of load has reduced the margin between the generating capacity available and the demand. This is the first year since 1918 that no increase has been made in the Commission's generating capacity. The increase in the peak loads of all systems was 71,500 h.p., as compared with 56,000 h.p. in the preceding year. Each system showed an increase in average load and only the Thunder Bay System recorded a lower peak load. The total hydro-electric output was 3,904,432,004 kWh, of which the Queenston plant (Niagara) provided 2,534,306,000 kWh, and the "Ontario Power" plant (Niagara) 729,334,500 kWh. In addition, 201,802,454 kWh was purchased, principally from the Canadian Niagara Power Co., giving a grand total of 4,106,234,458 kWh, against 3,796,157,703 kWh in 1925-26. In the above mentioned Queenston and Ontario plants the peak load came within a few kW of the normal operating capacity, while in several cases the operating capacity was exceeded by the peak load. Taken on the whole the peak loads showed an increase of about 11 per cent., which is about the average for the last ten years, but the total output did not increase in proportion.

In the Niagara System there was no new construction; the operation of the system in two sections was continued with satisfactory results. Queenston, on account of its ability to develop double the amount of power for the same water diversion, carried the main or base load up to its capacity and as far as interconnections permitted, the balance of the load being divided between the Ontario Power and Toronto Power plants. The load-despatching system inaugurated in the previous year was continued and developed to give the greatest possible power output from the amount of water which the Commission is permitted to divert from the Niagara River. During the summer months, when the seasonal reduction of load permitted, each of the nine units of the Queenston plant was shut down in turn for inspection and overhauling; this will be necessary each year.

In the hydraulic engineering and construction section of the report it is stated that the Hanna Chute development (Georgian Bay System) was put into commercial service in October, 1926. This is the third station built for operation by remote control, and it has satisfactorily met all operating requirements. Active construction has been under way throughout the year at the Alexander power development (Thunder Bay System) which is situated on the Nipigon River about 1¼ miles below the Cameron Falls generating station. The cofferdam for the diversion of the river past the site of the earth dam has been practically completed on each side of the main channel of the river and is ready for closure. The diversion canal to carry the water to the lower river, together with the concrete control works, has also been completed and other works are nearing completion. Early in the fiscal year the contract for three 18,000-b.h.p. turbines was given to a Toronto company. During the year continuous hydraulic investigations and tests were made in all systems, and a great deal of work was done on distributing sub-stations and transmission lines.

It is stated that the Commission was actively engaged in the co-operative work of drawing up a code of rules for electrical installations; the Chief Testing Engineer was chairman of the Code Committee. The Canadian Electrical Code has been adopted by the Commission and will shortly be published as the eighth edition of the Commission's Rules and Regulations. Work in a large variety of directions was carried out by the laboratories during the period under review. Among them may be mentioned resuscitation research, lamp testing, the use of structural silicon steel for transmission line towers, galvanising, transformer-oil and paint testing, &c.

The Approvals Laboratory received 297 applications for approval reports. Of these 30 per cent. related to heating appliances, 18 per cent. to motor-operated equipment, 16 per cent. to lighting appliances, 15 per cent. to wiring devices, 14 per cent. to radio appliances, and the balance to switches and miscellaneous equipment. In addition some 30 applications were received for special report on provisional approval of various devices, and 110 applications for the listing of equipment approved by Underwriters' Laboratories. There was a marked increase in the number of applications for the approval of power-operated radio sets.

The Electrical Inspection Department issued 89,425 permits and made 169,098 inspections. During the year the Department supervised the work of bringing 5,407 installations up to a reasonable standard of safety. Only three fires were, after careful investigation, attributed to defective electrical equipment; this is considered insignificant having regard to the fact that the number of consumers in the Province is over 400,000. There were no fatal accidents in connection with any apparatus or equipment under the control of the Department. There are special regulations for theatres and kinemas and an annual inspection is made so that there is no risk of fire in any theatre in the Province with respect to the electrical installation. Four pages of the report are devoted to electrical inspection in Ontario; the necessity for inspection is shown, the Commission's Rules and Regulations are briefly reviewed; and there are a number of useful hints to consumers. This particular section would be useful, with suitable treatment, for reprinting and circulating to the public. The report proper is concluded with a chapter upon the Commission's electric street railways; both systems (Essex District and Guelph District) showed a financial loss.

About 300 of the 400 pages of the report contain statistical tables giving very complete details of the operations of each municipal utility. A complete index is appended and the volume is well illustrated. There is a large-scale map of the area in which the Commission operates.

The Public Lighting Conference.

An account of the proceedings at the conference and annual general meeting of the Association of Public Lighting Engineers at Sheffield.

(*Concluded from page* 171.)

Visibility in Streets.

By J. M. Waldram, B.Sc., A.C.G.I.

(*Communication from the research laboratories of the* General Electric Co., Ltd.)

(*Abstract.*)

The parties interested in the visibility in streets are the police, the pedestrian, and the driver; and their requirements do not in all respects coincide. The police require that there shall be no dark corners or heavy shadows; the pedestrian requires to be able to see small obstructions, kerbs, puddles, &c., and the numbers on houses at all positions along the street; the driver must be able to pick out with ease and certainty, and at a considerable distance ahead, any object on the road or any pedestrian, without the use of his headlights, for it should be unnecessary to use headlights on a properly illuminated road. The requirements of the first two parties are reasonably met by the provision of a certain minimum of illumination, measured not on the line joining the fittings, but at the point on the footpath most remote from the light sources, where the illumination would normally be expected to be a minimum, as laid down in the recent B.E.S.A. Specification for Street Lighting (No. 307, 1927).

Objects are distinguished by (*a*) contrast in brightness in the object itself, or between the object and its background, whereby either the details of the object, or the object itself, are perceived; or (*b*) by difference in colour between various parts of the object or between it and its background; or (*c*) by a shadow cast by the object. For street lighting (*b*) can be neglected, since colours can scarcely be distinguished under street lighting conditions and play no important part in the visibility of objects.

It is generally assumed that an object at mid-span, where the illumination on a horizontal plane is low, is more difficult to distinguish than at other positions, but this is by no means the case; in fact, an object at this position is generally very easy to see. Although the value of the minimum contrast depends only on the value of the diversity of brightness of the road surface, the position of the object at which it occurs is very indefinite; it can be shown to depend upon (1) the reflection factors of the object and of the road surface, and (2) the distribution of brightness along the road surface. The position of minimum contrast is, however, generally close to the post, on the side further from the observer, being further from the post as the object is lighter. With darker objects it is often impossible to obtain the minimum possible contrast at all; for the object is never bright enough, and appears always as a dark object on a lighter background.

Pedestrians are seen for the most part (for two-thirds of the span, even for light objects) not by the light which falls on them, but by the light which is reflected off the road surface at a point at a considerable distance behind the object. From the point of view of visibility there would not seem to be much justification for referring the illumination of streets to a horizontal plane situated three feet above the surface of the road. An interesting conclusion, the truth of which can easily be observed in practice, is that when a pedestrian is thus seen in silhouette, the first effect of a motor car headlight when it begins to illuminate him is to destroy the contrast with the road and to make him *less* visible.

The height of a small obstruction may be insufficient to contrast with the parts of the road remote from the spot on which the object is situated. In this case the shadow is often the most important factor in revealing its presence.

The first attempt at quantitative measurement was to measure the time necessary for an observer to perceive a given object which seemed a reasonable basis, for the prevention of accidents with fast-moving traffic is dependent upon the rapid recognition of objects by drivers of vehicles. After considerable experiment, however, it was found that the observer was often able to see objects which, in the judgment of ordinary persons, would be dangerously inconspicuous in practice, and it was for this reason that the method was abandoned. It was made evident that there is a considerable difference between the contrasts which the eye is capable of perceiving if the observer is shown where to look and what to expect, and the contrasts which are necessary to make him notice an object for which he is not consciously searching. An object may be perceptible which is not necessarily noticeable; a sign illuminated continuously is just as visible as a flashing sign, but the element of movement and interruption in the case of the latter increases very considerably its noticeability. Thus, since in practice the driver of a vehicle has to be able to notice a pedestrian who may appear without warning anywhere on the road, values of least perceptible contrast obtained under laboratory conditions will be of little value if applied without proper correction, which is a point of some importance.

The method is now being tried of determining the least contrast which a pedestrian must present if an observer is to notice him at any position in the field of view. The experiments are still in the initial stages, and may possibly prove abortive.

Experimental observations of a qualitative character which have been made either with a model street or in actual streets seem to indicate:—

(*a*) *Effect of Average Road Brightness on Noticeability.*—The mechanism of visibility is not the same in high and in low illuminations. A solid object, such as a pedestrian, when illuminated, is not uniformly bright, as a figure cut from a flat sheet would be, but presents contrasts in itself apart from its background, caused for instance by shadows or by the fact that its surface, not being flat, is not uniformly illuminated. At low brightness levels these "internal contrasts" do not appear to be noticeable, possibly by reason of the decreased sensitivity of the eye; but at higher levels they would appear to be in some cases as important as the contrasts between the object and its background. It is by this effect that objects are recognised in daylight. At these higher levels, where the mechanism of vision apparently changes, diversity of brightness plays a less important part than in the case of streets with less illumination, and visibility by internal contrasts comes in as an additional factor in rendering the object more noticeable. Shadows cast on one part of the object by another contribute largely to this factor; and these shadows will obviously be increased if the suspension height is increased, as is usually the case in the higher classes of installation.

(*b*) *Effect of Diversity of Brightness on Noticeability.*—An increase of minimum noticeability accompanies an increase of diversity of brightness, at least in roads in which the surface is fairly matt. For wide roads, double side spacing is to be preferred.

(*c*) *The Effect of Shaded Light Sources on Noticeability.*—Especially in the lower grades of installation, the use of fittings having a sharp cut-off which prevents all but the first source from being seen (to cut off the light beyond the foot of the succeeding post, which does not interfere with the mid-span illumination, but prevents the observer from seeing any but the first source, which is in any case usually naturally obstructed) increases perceptibility from two to three times. It is interesting to find that an observer can see three times as well if some of the light is removed from the street, but observations all tend to show that such is indeed the case. The appearance of the lighted street is unusual, if symmetric shades are used which cut-off at the same angle in all directions, as light is thereby kept off buildings, which is always a disadvantage, but it could be overcome by using a partial screen. It is quite possible that there may be additional advantages in the way of increased comfort, apart from the definite increase in the ability to see, as the use of shaded lights gives an impression of being able to see better.

(*d*) *The Illumination of Polished or Wet Roads.*—When road surfaces are polished instead of being diffusing, the appearance of the lighted street is completely changed; instead of light and dark transverse bands, longitudinal streaks are formed running from the observer towards each light source. Under such conditions the only way of detecting the presence of an obstruction is to watch the streaks, and if an obstruction is so placed that the light forming one of the streaks is cut off by it either before or after reflection at the road surface, the streak will be partially or completely blacked out. It follows from this that for normal roads and particularly for the lower illumination categories, it is better to provide sources on both sides of the road, so that there will be more possibility of objects being perceived however the road curves. Central suspension is also at a disadvantage in this respect, for it may be considered as two systems of single side spacing placed back to back.

The most important point is evidently that no matter how much illumination (within reason) is provided on a really wet road, it is impossible to increase its brightness materially at points outside the bright streaks. It should be noticed also that the brightness of these streaks exceeds considerably the brightness of the bands associated with a matt surface, for a shiny or wet surface approximates to a mirror, and its brightness therefore tends to become equal to that of the source; but in a diffusing road surface the brightness, even if the surface were perfectly white, could never be more than a small fraction of this value. It is evident that the position of the light sources when the road surface is wet is of much more importance than their power or intensity distribution. This is particularly noticeable on curved roads, where it is important to place the sources on the outside of the bend, for those on the inside, though they are equal in power to those on the outside, have no effect in making the road surface appear bright. Since the brightness of the specular patch on a wet road is dependent almost entirely on the brightness of the source and

hardly at all on the illumination on the road surface, a very small or a very distant source will suffice to give a useful streak on the road against which objects can be seen in a part of the road otherwise completely dark; such a device might be useful in practice in special cases.

Conclusions.—The following schedule is a summary of the conclusions reached in the paper:—

(i) Illumination level:—Increase produces higher perceptibility, and if sufficiently increased allows discrimination by internal contrasts; less important on wet roads.

(ii) Diversity of illumination:—On dry roads increases diversity of brightness and contrasts; on wet roads unimportant.

(iii) Height of source:—Increase reduces brightness diversity and gives smaller background contrasts, but less glare and greater internal contrasts.

(iv) Spacing-height ratio:—Increase produces greater glare, but higher brightness diversity and more marked contrasts; it should not be carried too far and long spacing is bad on wet roads.

(v) Arrangement of sources:—(*a*) Single side: not recommended; bad on polished or wet roads. (*b*) Central: better than (*a*), but liable to be bad on wet roads. (*c*) Staggered: good, but should be used with caution on wide roads. (*d*) Double side: better than (*c*) for wide roads; good for wet roads.

(vi) Shading of sources:—Considerably reduces glare and increases comfort; light should not be cut off buildings and kerbs.

Discussion.

Mr. C. C. Paterson (director of the G.E.C. laboratories, Wembley) said that the subject of visibility was of increasing importance and he felt it was very right that the consideration of street-lighting installations should be very largely from that point of view. Those of them in the Engineering Standards Association who had endeavoured to launch the beginnings of a street-lighting specification were on right lines in giving much attention to visibility. The work which Mr. J. F. Colquhoun had done in this matter since the conference twelve months ago was of inestimable value. What Mr. Waldram's work seemed to show was not that there was anything wrong in the specification, but that there were other limitations which must be considered in designing the installation. They must keep their minimum illumination on the road right, and what Mr. Waldram had brought out most strongly was that the placing of the posts was an additional limitation which must be considered very carefully indeed in the design and positioning of installations. He would like to correct one impression that Mr. Waldram might perhaps have left in some minds: there was nothing in his paper which gave any support to what Mr. Haydn Harrison had well described as beacon lighting; there was nothing which justified a continuance of the system by which the posts were so far apart that they only produced patches of light at intervals; beacon lighting, especially on very wet roads, could not be regarded now as tolerable. Mr. Paterson thought the essence of the paper was in the last paragraph. They were all feeling in the dark still to find some safe principles from which to obtain a better consideration of the whole subject, rather than laying down definite rules. That, indeed, was what was in the minds of those who prepared the specification; they aimed at setting everybody engaged in street lighting thinking along certain lines. Dr. J. W. T. Walsh (N.P.L.) thought the essence of the paper was that it pointed out that a certain degree of contrast in street lighting was desirable, if not essential; only recently had it been realised that uniformity of illumination all along the street was not the right idea at which to aim. Owing to the peculiar reflective characteristics of road surfaces, uniform illumination did not necessarily bring about uniformity of brightness; further, the paper pointed out that a diversity even of brightness was desirable to bring about noticeability of the object. Dr. Walsh rather fancied he noticed a slight tendency towards a swing of the pendulum, and there might be danger of going right away from the old idea of uniform illumination to that of large contrasts on the road; but that would not be correct without modification. He mentioned two aspects of the problem which showed that too much contrast could be as dangerous as too little: first, the time element, for everybody knew how very trying it was to do anything in a flickering light; the alternate light and dark patches and objects as seen by the driver of a fast vehicle were to him the equivalent of a flickering light. The other point was the equivalent of dazzle; if one had very much contrast several spans ahead, the effect tended to reduce the noticeability of objects. Dr. Walsh fully agreed that a certain amount of contrast was very desirable, and it was interesting to recollect that the president's own address to the conference mentioned the same point and that Mr. Colquhoun was bold enough to state a figure, probably a very reasonable one, of what was required.

Mr. S. B. Langlands (Glasgow) remarked that there must undoubtedly be much more close working between city and borough engineers on the one hand, and electrical engineers on the other, in the matter of road construction and in the study of road surfaces.

Mr. Haydn T. Harrison (London) said visibility was the object of street lighting. Nature taught a most valuable lesson in the importance of visibility by the manner in which animal life was given colour to resemble its environment and the reflecting value of surrounding objects. The same thing was done more or less unconsciously in human activity. Everything in the course of its movement down a lighted street must reach some point, or points, at which it became almost invisible, and sometimes that period of invisibility was not merely a point, but quite a distance. There were two sides to visibility: the production of the means of illumination, and the reflective values of objects affected by the illumination. If they wanted to tackle visibility they must clear the question of contrasts, and he was inclined to think it would lead eventually to some bye-law by which vehicles were made to have light exteriors, so that they would stand out against the usual sombreness of their surroundings.

Mr. Jones (Electric Lighting Bureau) was rather puzzled about whether they would have to specify a different type of lighting for each different community. It must be borne in mind that small variations in the amount of illumination did not mean the same percentage difference to human sight; the eye was only sensible of changes like 50 or 100, or even 200, per cent., so that if the lighting was going to be improved by changes of lamps they must be changes, not from from 40 to 50 or 60 watts, but very much more in order to produce something markedly different. Mr. Jones was glad the author had emphasised the desirability of placing lighting units on the outside of the kerbs rather than the inside, a matter of particular importance when perspective reflection was increased by wet surfaces.

Mr. E. J. Stewart (Glasgow) hoped the paper would prove to be only one of a series on this important subject. It had raised points which needed much thinking over, and some of them suggested the possibility of other papers on other aspects of this very complicated problem. Another stage seemed to have been reached in the consideration of street lighting, and it was up to the lighting profession to go out into the streets and see for itself. The paper had not given much attention to the lighting of footpaths, but they must not entirely forget them for the sake of the motorist; a street might be well lighted from kerb to kerb, but in view of the movements of pedestrians on and off the road, the road was safer if illuminated from the back of one footpath to back of the other footpath, rather than from kerb to kerb. The effect of shadows was very small in revealing visibility, and he had been much struck while viewing the demonstration installation the previous night by the visibility of the shadow itself, at some places at 100 yards and over. The background of importance might be a quarter of a mile away rather than the surface of the street itself. The importance of considering wet streets was increased by the fact that when wet visibility of things to the driver was reduced by other factors.

Mr. E. Stroud said the idea of uniformity was to ensure that there was a reasonable minimum of illumination, feeling then that the remainder of the lighting would be good.

Mr. J. M. Waldram, in reply to the discussion, said he certainly had no intention of advocating beacon lighting, although it was better than no lighting. He agreed that it was possible to have too much contrast, just as it was possible to have too little. Would light-coloured objects on the road be advantageous? Personally, he felt that light-coloured objects would decrease, rather than increase, the visibility; the better way was to keep up the road brightness. With regard to the distance at which a motorist ought to be able to pick out a pedestrian or other object without head lights, he thought it ought to be two spans, about 300 feet. Centre lighting was the most efficient way of getting light on to the street itself, but some of the light was expended in useless directions and the responsibility of the lighting engineer did not end when he put light on to a street in useless directions.

High-frequency X-rays.

Extreme-high-frequency X-rays, generated in a million-volt tube, are the next item of promise on the programme at the California Institute of Technology. Allied to the investigation of the cosmic rays, which has recently yielded interesting results, is an attempt at the artificial production of very short waves, and therefore very penetrating radiation. In the hands of Messrs. C. C. Lauritsen and R. D. Bennett this work has already yielded some promising results.

As yet no apparatus can be devised for handling the terrific electric potential required for the artificial production of cosmic rays. For intermediate rays of about one-twenty-thousand-millionth of an inch wave-length, however, there seem to be experimental possibilities. Such rays are much shorter than the surgeon's X-rays and much more difficult to produce.

The X-ray "tube" used in the new work is several yards long. A water-cooled anode raised to a potential of a million volts pulls electrons violently out of the nearby cathode; under this terrific force the electrons attain a speed very near 186,000 miles per second, the velocity of light. Striking the anode at this enormous speed the electrons generate X-rays like the gamma rays naturally emitted by radium.

In preliminary trials now being made in the high-pressure laboratory of the Institute, where a million volts to ground at a thousand kilowatts is available to the experimenters, Messrs. Lauritsen and Bennett have succeeded in obtaining continuous operation of their new tube at voltages that have approached the million mark. The high-frequency rays produced were observable through the steel doors of the laboratory more than 100 feet away.—*Science.*

Rural Electricity Supply.

Extracts from the report of the proceedings of the Conference on Electricity Supply in Rural Areas convened by the Electricity Commission.

EARLY in 1927 the Electricity Commission decided to generally review rural electrification in Great Britain, which subject has become specially prominent since the Central Electricity Board's regional schemes enhanced the prospects of supplies of energy becoming available in areas where there is a reasonable demand for electricity. As a preliminary step, a memorandum on electrical development in rural areas was issued in August 1927, dealing more particularly with the importance of overhead-line distribution and wayleave facilities as factors in the economic extension of rural supplies, and inviting the active support of local authorities, landowners, and others who are in a position to afford facilities in connection therewith. The Commissioners then commenced to review the Regulations and procedure applying to overhead lines and wayleaves, with the object of determining what modifications could be made in order to facilitate development in rural areas. As a further step, the Commissioners convened in November, 1927, a conference to which representatives of the various Government departments and of associations and other bodies, as well as individuals interested in different aspects of rural electrical development were invited, with the view of co-ordinating the results of prior and concurrent investigations and of obtaining such further information as was necessary for a general survey of the position.

The Conference has been engaged for the last six months in investigating certain aspects of the subject, and has prepared a report of its proceedings,* and the Commissioners have arranged for its immediate publication in advance of consideration of the various recommendations embodied therein.

The Conference, which was presided over by Sir Harry Haward, vice-chairman of the Commissioners, appointed two sub-committees to investigate (i) the nature and extent of the potential demand for electricity in rural areas; and (ii) the bearing and general effect upon rural development of the price of supply and the cost of electrical equipment. It also remitted the question of publicity and propaganda to the British Electrical Development Association for consideration after consultation with certain other representative bodies.

Nature and Extent of Potential Demand.

The report of Sub-Committee No. 1 (chairman: Sir Douglas Newton) commences with a review of the salient statistics relating to the area and population of the rural portions of the country, and points out that the provision of an electrical service for rural areas of wide extent and a low average density of population presents economic considerations of a kind substantially different from those applying in the case of urban areas. Statutory powers for the supply of electricity for *all* purposes already exist as regards about 53 per cent. of the rural areas of England and Wales, containing upwards of 69 per cent. of the rural population, with an average density of 196 persons per sq. mile; limited powers of supply for certain purposes exist in other rural areas; and the "unoccupied" portions of rural England and Wales, in which no supplies of electricity have hitherto been authorised, cover about 40 per cent. of the rural areas and include about 22 per cent. of the rural population with the much lower average density of 85 persons per sq. mile. While the areas presenting the better possibilities are covered by statutory powers, the prospects of electrification depend not only upon the existence of a remunerative demand, but also on the readiness with which the various undertakers concerned are prepared to carry out the obligations attaching to their statutory powers.

The Conference attaches importance to the completion by the Commissioners of their analysis of the existing developments in distribution areas throughout the country, since this analysis will indicate the exent of the rural territory in which supplies of electricity are being given, or on the point of being established, and also reveal the extent of territory covered by distribution powers which have not yet been put into force.

The report then reviews the available statistics for the present supply of electricity in 669 townships and villages in rural areas in Great Britain, embracing a total population of over 1,400,000 inhabitants, and makes special reference to the value attaching to the load of the larger individual consumers. In the great majority of cases where supply has been established in recent years, the present average consumption of electricity ranges from 16 to 20 kWh per year per head of population, pointing to the broad conclusion that the sale of electricity in townships and villages by the end of the second or third year after the commencement of supply does not, as a general rule, amount to more than about 20 kWh per head of total population, in the absence of one or more large individual consumers, or a reasonable power load. However, a consumption of about 60 kWh per head should be attained in the more promising rural areas in three or four years after the commencement of supply.

There were 1,770 farms connected to public supply mains in rural areas in Great Britain at the end of 1927, the electricity consumed in that year by 1,473 farms for which particulars were available amounting on an average to 1,150 kWh per farm. An analysis of the particulars for 834 of the farms according to the scale of consumption during the year, and the uses made of the supplies, shows that the farms as a whole did not make any substantial use of electric power for the various processes associated with farming. Reference is also made to the value to a rural electricity undertaking of the substantial loads obtainable from individual farms.

Character of Rural Demand.

The present demand for electricity by rural communities and farms is for lighting, heating, cooking and other domestic purposes, and for power purposes; the chief differences reside in the purposes for which electric power is applied, particularly in connection with farm operations; no distinctive applications of electricity pertaining only to rural or agricultural operations have hitherto been adopted in any general way in the country, but much scope exists for further application in connection with farming and horticultural operations in the more advanced *urban* areas; the consumption in average middle- and working-class houses ranges from 100 to 300 kWh per annum for lighting only, but reaches 1,000 to 3,000 kWh per annum when electricity is also used for cooking, occasional heating and for various labour-saving devices. The Sub-Committee indicates that distinct possibilities attach to the general domestic demand in rural areas, and expresses the view that this load is an important factor in rural electrification.

The conclusion is drawn that when electrical equipment of ordinary character is installed for farm purposes and reasonably full use is made of electricity both for farming and farmhouse purposes, individual farms of the types in question are likely to represent, on a conservative basis, potential consumers to the extent of from 4,000 to 14,000 kWh per annum.

Forecast of Demand.

The report points out that for economic reasons rural electrification cannot be proceeded with to the extent of placing a supply of electricity at the service of every inhabitant, farm, and other premises throughout rural Britain. After commenting upon the low order of the prospects in the sparsest and most remote areas, estimated to comprise up to 50 per cent. of the area (but not population) of the rural portions of the country, the Sub-Committee expresses the opinion that in the case of the more promising rural areas of a suburban character, or located in territory surrounding urban centres, a degree of development represented by a consumption of about 60 kWh per head of total population should be attained in the course of three or four years from the commencement of supply, and that in the case of the next surrounding belts of rural territory, consumption of the order of 30 or 40 kWh per head of population might be expected in favourable circumstances. To achieve such development it would be essential for an attractive two-part tariff to be offered, and facilities for the hire or hire-purchase of apparatus to be accorded to potential consumers.

The broad conclusion at which the Sub-Committee arrived is that a potential demand growing to the order of 230,000,000 kWh per annum in the course of the next ten years is indicated for the rural areas in Great Britain where supply powers already exist. The Sub-Committee emphasises the important part which overhead lines and wayleaves must play and the need for still further revision of the Regulations affecting the construction of overhead lines.

Price of Supply: Cost of Equipment.

The report of Sub-Committee No. 2 (chairman: Mr. J. H. T. Legge) first points out that the limits of price within which supplies of electricity would have to be offered in rural areas to ensure its *general use* are affected by (i) the cost to the potential consumer of alternative forms, or sources, of light, heat and power, and the value attached by the consumer to the convenience and utility of an electrical service; and (ii) whether it is economically practicable for undertakers to provide supplies within that limit.

Relation Between Revenue and Capital Expenditure.

In the light of the average working results of all the electricity undertakings in the country during the four years from 1922-23 to 1925-26, remunerative working has involved, on an average, the obtaining of an *annual revenue* representing about 20 per cent. in relation to the *total* capital expen-

* H.M. Stationery Office, Price 1s. net.

diture on an undertaking; upwards of one-half of such revenue was required for meeting working expenses, including the cost of generating or purchasing electricity; and the balance provided for interest, loan repayment, sinking funds and dividends in respect of capital, and for reserve, renewals, depreciation funds, &c. The Sub-Committee saw no reason for concluding that the general relation between revenue and total capital expenditure for remunerative working in the case of rural electrification would differ to any extent from the average results indicated above.

The Conference considers it necessary to emphasise that the percentage figure adopted by the Sub-Committee does not represent a clear profit or margin over and above all the costs and charges involved; and that a *gross* revenue amounting to 20 per cent. on the total capital expenditure on an undertaking would have to meet all the working costs of providing, transmitting and distributing supplies, only the residual part of the revenue being available for capital charges, such as interest or dividends, loan repayment and depreciation. It is also necessary to distinguish this percentage on *total* capital from the relationship laid down in the Electricity Acts between revenue and *particular* capital expenditure on distributing mains for giving supplies to an individual consumer. Such a consumer has not only the use of the particular line by which his supply is provided, but also the partial use of other portions of the system of the undertaker (such as the generating station, the main substation in the case of bulk supply undertakings, transmission lines, feeder mains, &c.) without which the consumer's particular line could not be furnished with a supply. When account is taken of the cost of such other works of which the consumer is a partial user, it is evident that a revenue from an individual supply amounting to 20 per cent. on the capital cost of the particular line required for that supply would represent a considerably smaller percentage revenue when related to the proper proportion of the total capital costs concerned in the giving of that supply.

It is emphasised that the circumstances attaching to different classes of supply necessitate and justify different scales of charge; that it is not possible to arrive at any one set of limiting prices for the main classes of supply which could be regarded as approximately applicable to every rural area; limits of price cannot be regarded as a practical issue in the case of up to 50 per cent. of the sparsest and most remote areas which offer such low prospects as to preclude, or at any rate delay for many years to come, the establishment of a public supply on a remunerative basis, even under the most favourable conditions of capital expenditure on rural distribution

Cost of Alternative Facilities.

The annual expenditure for lighting by means of oil lamps ranges from a minimum of 25s. in the case of average cottage premises, and from £3 to £5 in the case of the generality of farms. An analysis showing the actual or estimated costs involved in connection with the lighting, heating and power requirements of 42 farms of various sizes and types is also given. The Sub-Committee formed the opinion that the costs of other facilities could not be regarded as presenting a serious obstacle to the adoption of electricity when offered on reasonable terms, and that the substitution of electricity would, as a general rule, prove an economic proposition to the average consumer, even when account was taken of the cost of installation

Limits of Price.

The *general* use of electricity for domestic and other purposes by the population in rural areas can only be brought about by the offer of a two-part, or "all in," tariff which will be attractive to the consumers and at the same time enable the undertakers to provide supplies on a remunerative basis, and the aim in view should be a limit of 1½d. or 1d. per kWh for the *unit charge* of two-part tariffs. The views of the Sub-Committee as to limits of price in the case of supplies from l.p. networks are as follows:—

(*a*) In the case of tracts of rural or composite territory in the neighbourhood of, and supplied from, an established undertaking in a large urban centre, or of areas of a composite character more remote from large urban centres, but containing a fair proportion of urban population located in small towns, and where an eventual degree of development represented by a consumption of the order of 60 kWh per head of population could reasonably be expected, the alternative rates of charge should not exceed (i) 8d. per unit for lighting; (ii) 2d. per unit for cooking, heating and general domestic purposes, decreasing according to consumption to 1d. per unit; (iii) 2½d. per unit for power purposes, decreasing according to consumption to 1¼d. per unit.

(*b*) In the case of the more remote and more sparsely populated rural areas of supply, where a degree of development beyond a consumption of the order of 30 kWh per head of population could not be reasonably expected, the alternative rates of charge should not exceed (i) from 9d. to 10d. per unit for lighting; (ii) from 3d. to 4d. for other purposes. The last-mentioned prices for other purposes will not be conducive to development, and the prospect of securing any general use of electricity in such areas will be dependent on the offer of a suitable two-part tariff.

(*c*) In the case of the most remote rural areas where a restricted electrical service only may be possible for such consumers as are prepared to pay a price which will ensure remunerative working, the limits of price may extend to 1s. per unit for lighting and 4d. or more for power and other purposes.

Electricity Tariffs.

It is stated that there are no special characteristics of any of the two-part tariffs hitherto devised that can be regarded as rendering a particular tariff pre-eminently suitable for rural, as contrasted with urban, development. Pending the formulation of a single tariff suitable for general application, two-part tariffs likely to be found most suitable for general use in rural areas are those in which the fixed or service charge is based on the ratable value of the consumers' premises, or the number of rooms wired, or the wattage of the consumers' lighting installation.

Revaluation of premises under the Rating Act of 1925 may have a disturbing effect in the case of existing tariffs based upon former ratable values.

Electrical Wiring and Apparatus.

The report deals in detail with the cost of wiring and apparatus, pointing out that the success of rural electrification is essentially dependent upon assisted wiring schemes and the hire and hire-purchase of apparatus for all classes of potential consumers. In the case of hire-purchase, that repayment by the consumer (unless otherwise desired by him) should be spread over a period of not less than three years.

The development of rural electrification on a commercially remunerative basis is essentially dependent, among other factors, upon the reduction to a minimum of capital expenditure on transmission and distribution by the adoption of an overhead system of inexpensive design. Rural electrification involves a capital expenditure ranging from £2.5 to £4 per head of total population, equivalent to from £600 to £1,000 per square mile of area served; and that an expenditure of the order of from £17,000,000 to £28,000,000 might be involved if an electrical service could be made available throughout the existing rural areas of supply in England and Wales, although not necessarily for the whole of the population therein.

Much loss of time and much expense would be obviated if a standard form of wayleave agreement could be devised and recognised officially as providing an equitable settlement between the grantor and the supply authority, and the electrification not only of rural, but also of urban, areas would be facilitated and expedited by reductions in the present costs of electrical wiring, lamps and apparatus generally.

Publicity: Propaganda.

The report submitted by the British Electrical Development Association reviews the principal factors involved, and emphasises the desirability of limiting the circulation of propaganda for the present to those rural areas where a supply is available, or likely to be available, in the near future.

Recommendations.

The reports of the two Sub-Committees were generally adopted by the Conference, subject in the case of certain of the recommendations to modifications and additions; the recommendations adopted or made by the Conference are as follows:—

(i) That the Electricity Commissioners regard the development of electricity supply in rural areas as a special branch of their work to which continuous attention should be devoted; and to appoint a special officer for the purpose.

(ii) That the Commissioners review their new Code of Overhead Line Regulations within the next two years, with the view of effecting further reductions in the cost of rural lines by relaxations as regards ground clearance and factors of safety in respect of lines for supplying sparsely-populated rural areas; and to consider the practicability of providing for different classes of construction for different types of rural area.

(iii) That the Commissioners urge undertakers to make a periodic canvass of the potential demand in the unsupplied portions of their areas; and to ensure that undertakers carry out their obligations in cases where there is a reasonable prospect of supplies being given on a remunerative basis.

(iv) That undertakers who are in a position to extend supplies into neighbouring "unoccupied" areas should be urged to obtain powers for that purpose in the absence of any other satisfactory proposals for supplying the areas in question.

(v) That statutory powers for the supply of electricity in new, or extended, areas should not be granted to existing undertakers, either by private Bill or by Special Order, unless the undertakers can show that they have not neglected their existing areas and have taken all reasonable steps to develop them. In cases where it is found advantageous that supply powers should be conferred upon a gas undertaker, provision should be made to ensure that the electricity powers are duly exercised.

(vi) That the Commissioners (*a*) devote a special section of their annual report to the supply of electricity in rural areas and the progress attained; and (*b*) invite the co-operation of authorised undertakers in furnishing appropriate statistics dealing with the technical and financial aspects of such supply, with a view to the periodic publication of a suitable summary.

(vii) That the principal Government departments concerned jointly secure the further investigation of the various other aspects of rural electrification.

(viii) That the Ministry of Agriculture and Fisheries and the Board of Agriculture for Scotland make available to bodies interested in electrical development a schedule of drainage authorities with particulars of their engine equipment; and to urge such authorities to take electrical power from a public system, when available, in lieu of extending or installing independent power plant.

(ix) That the Commissioners urge upon supply authorities the desirability of greater uniformity in respect of methods of charge and to invite the principal Associations jointly to formulate definite proposals for achieving that object.

(x) That undertakers engaged in rural electrification who have not hitherto offered a multi-part, or "all in," tariff for general domestic supplies should be urged by the Commissioners to do so.

(xi) That the Commissioners invite the assistance of the principal representative Associations of the Electrical Industry in devising a practical financial scheme for ensuring that facilities in the way of assisted wiring and for the hire or hire-purchase of apparatus are available, wherever needed, to prospective consumers in rural areas of supply.

(xii) That, with the view of facilitating the electrification of farms in the occupation of tenants, the representative associations of the various bodies concerned be urged by the Commissioners to confer on the question of obviating the risk of loss of tenant farmers on expenditure on electric wiring and fixtures in the event of an early termination of tenancy.

(xiii) That the principal associations connected with the electricity supply industry consider the practicability of arranging for an annual conference of managers and engineers of municipal and company undertakings for the purpose of an interchange of views on urban and rural electrification.

The Conference desires that a further meeting should be convened after an interval of, say, twelve months for the purpose of considering the action which had been taken meanwhile upon the various recommendations embodied in this report.

The International Union of Producers and Distributors of Electricity.

A Report of the Proceedings at Paris, by our Special Correspondent.

(*Continued from page* 176.)

International Statistics.

A GENERAL report on the above subject was presented by Mr. M. Ganguillet, secretary of the Union of Swiss Central Stations, covering a French report by Mr. Marty, secretary of the Union, a Swiss report by himself, and a project of Mr. Norburg-Schulz.

It was pointed out that there was a real necessity for reliable statistics to offset false statements met with regarding electrical matters. In some countries the laws made progress difficult; in some cases the State was financially interested in the distribution of electrical energy, and in others the business was left entirely in the hands of private initiative. It was important to limit the details, at the commencement in any case, to the most important particulars. There was the question regarding the quantities of energy produced for their own uses by mining, metallurgical, and chemical undertakings which only sold a fraction of their output. According to the proposal in the report of Mr. Marty, international statistics should include the total available means of production of such undertakings and the total quantity of energy produced.

According to the Swiss proposals the statistics of the "Union Internationale" should only cover that part of the power of such undertakings sold to third parties. The International Union was based on an industry in which the members were rarely in competition with one another, and it was therefore easy to obtain particulars, but the whole situation would be changed if figures were given relating to requirements for electrochemical and suchlike industries.

Use of 230 V to Neutral.

A report by Mr. Ferand, Nord-Est Parisian Co., on the use of 230 volts to neutral was interesting, because it showed that in other countries there was a trend towards the practice adopted in England. It was pointed out that for the same current density and percentage loss the transformer radius of 500 metres at 115/200 volts could be increased to 2,000 metres at 230/400 volts. The minimum section of copper allowed in France for l.p. lines was 7 sq. mm. In concrete examples the economy in copper varied from 25 to 45 per cent. On the other hand, the consumption of normal lamps was increased considerably. The use of the higher voltages for an average house installation involved an increase in first cost of from 100 to 150 fr., and from 20 to 30 fr. per year extra for current. There was no greater danger with 230 V in good installations.

A Commission had been appointed by the power companies in the Paris area to standardise all the material used by them; it was now examining the question of l.p. material, acting in collaboration with the "quality marks" (Unis-France) organisation of the Union of Electricity Societies of Paris. The Union also published codified wiring rules; an effort was being made to have wiring contractors put on a register. A Society of Propaganda examined apparatus and carried out tests. Where U equalled the pressure between phases and did not exceed 150 V, the following formula was used: $T=2U+100$.

When the pressure between phases exceeded 250 volts, the formula used was $T=2U+1{,}500$.

As a rule, danger came less from apparatus than from accessories, such as plugs and flexible cords. Some distributors insisted on the use of transformers giving 25 volts for use in wet situations and with certain tools such as hand drills. During the discussion it was urged that it was not merely a question of good contractors, but of good workmen also; if there were to be rules the workman must understand them and put them into force.

Electricity Tariffs.

Mr. J. G. BELLAAR SPRUYT, president of the Association of Electrical Enterprises of Holland, delivered this report. He said that if too many factors were actually dealt with in the prices charged the measuring apparatus became too complicated and costly. For large consumers each case could have special consideration, but for small ones an average must be taken. All countries gave special prices for large consumers under very varying conditions; in the U.S.A. there was no general starting point, but usually consumers taking current at high pressure were considered as large ones. In France special tariffs were usually given, starting at 10 kVA. In Barcelona the lower limit was from 200 to 1,000 h.p. In that country, where water power was used to a material extent, a single tariff was used which was reduced with quantity. In Spain, generally, the prices varied from .38d. to .6d. In Belgium the l.p. tariffs were usually single, and the h.p. ones double, the prices varied with the cost of production and the importance of the consumer from 15s. to 40s. per kW, and from .033d. to .076d. per unit. In Denmark, if the consumption was entirely outside lighting hours, a flat rate was given, otherwise it was a two-part tariff. In France the basis price varied with a special economic index for electricity, depending on coal and wages. In the third quarter of 1927 this index varied from 200 to 375, depending on the area. Where water power was concerned half the economic index was used to make up for increased salaries, &c.

In Barcelona and Switzerland the power factor was measured, and in France in many cases the reactive energy was measured. In Belgium reactive energy was measured in cases of h.p. supplies, and then a meter was often used which measured reactive energy only in the direction towards the consumer.

In Barcelona .75 to .85 was taken as the normal p.f., depending upon the consumer's loading, and with lower p.f.'s the price per unit was increased by 10 per cent., and if as low as 60, by 20 per cent. In Switzerland a p.f. of .8 was considered as normal, and in some cases reactive energy had to be paid for separately. In the U.S.A. it was usually demanded that the p.f. should exceed .7. In Denmark the reactive must not exceed 40 per cent. of the active energy, and if this value was passed a "kilosin-hour" was charged as 1/15th to 1/20th of the price per unit. In France, in some cases what was termed the complex energy was charged for; in some cases .8 was taken as the normal p.f., and the price per unit increased by 2 per cent. for each 1 per cent. reduction in p.f. For the delivery of leading currents by customers special contracts were the rule. In Switzerland energy was sold cheaper in the summer than in winter, and in Holland there were certain tariffs for summer consumers (March to September). In Belgium lighting was from 2.9d. to 4.3d., and for small motive power those prices were usually halved. In France the difference between lighting and other uses amounted to from 30 to 50 per cent.

In Switzerland the prices varied greatly: Lighting during the peak hours was from 3.84d. to 7.6d. per unit, during the night from .29d to .57d., and during other hours from 768d. to 3.84d. For small motive power the rate was reduced with the consumption from 1d. to 2.6d.

In Barcelona, Denmark, Holland and Belgium the maximum demand was not taken into account, although in Belgium the consumer had to guarantee a minimum. In Switzerland a fixed charge for light per year was much used in rural districts, the charge working out at about .38d. per watt per year. In Barcelona fixed charges had been abolished owing to abuses. In the U.S.A. differentiating tariffs were getting less frequent.

In Holland a system was increasing by which a certain charge was made based on the possible lighting load, or on the floor area, the remainder being sold at the low rate of about 1d. per unit in towns and 2d. in the country. In Switzerland multiple-tariff meters were frequently used, some for four different rates, depending on the hours of the day, independently of the use made of the electricity. The price also varied with the consumption and the season, a special reduction being made in the summer.

Mr. GROSLIER said that in France a consumer could demand to be connected, but the supplier could ask for a minimum consumption. The Compagnie Parisienne, which supplied Paris city, when selling at h.p., did not usually differentiate between lighting and other uses. Special night tariffs were getting customary, the hours being from 6 to 9 at night, to 6 or 7 in the morning; the tendency was to give night rates at the factory during the lunch interval. It was recognised that measurement at high pressure often involved excessive cost of installation, and therefore arrangements were often made whereby special transformers were installed and the supply measured on the l.p. side; for the copper losses a percentage addition was made to the units. For the iron losses a fixed charge was made, or they were measured between half load and full load and an hour-meter covered the time the h.p. switch was closed. Regarding the coal-cost formula, since 1921 an economic index had been published by the Ministry of Public Works which not merely depended on the cost of coal, but also on the wages and salaries compared with those of 1918. The coal price was published relating to each area.

It was pointed out that it was not good policy to press for charges for bad power factor too far, as it tended to encourage the use of private generating plant. In a number of cases where the customer's p.f. was about .6 and demands of the order of 100 kV, experience had shown that by the installation of synchronous or compensated motors the capital cost had been covered in two years.

Owing to the fact that plant and general arrangements were made for a certain power factor, some undertakings objected to the idea of a bonus for leading p.f.

Since the war the capital cost of rural lines had been not only found by supply authorities, but partly by the consumers, a fixed charge having been made in many cases, sometimes in accordance with the size of the meter and sometimes on the acreage of land held by the consumer. In certain areas where the inhabitants were very scattered, the cost of collection was high, and in some cases a material proportion of the cost was found in periodical fixed sums with smaller relative amounts on the meter. The indoor appliances of a farm required a relatively high amount of power, although the demand for each price of apparatus was small. The tendency of the small holder was to work out of doors in the day, and when it was getting dark to go home and set the machine to work. One way out of that difficulty was to limit the power used at one time under a two-part tariff, and to encourage a better load factor, the fixed charge being based on the meter. As a rule the reactive energy was not allowed for in low-pressure supplies.

Illumination Society.

A very interesting visit was made by a number of members of the Union to the Société pour le Perfectionnement de l'Eclairage. This is a society supported almost entirely by electricity supply authorities, and its object is to help owners of factories, public authorities, shopkeepers and householders generally regarding the best way to get the best illumination from all points of view. For this purpose in a remarkably small space on one floor of a residential and business block of flats, a series of demonstration rooms and offices have been arranged, at which information and assistance can be obtained free of any charge whatsoever. The society is willing to study plans, &c., and give advice gratis to builders, contractors, architects, workshop owners, shop keepers and private individuals upon lighting matters, and specially urges that if consultation is required regarding new buildings, &c., that they shall be asked to assist before the wiring and outlets are decided on or fixed. One can see all the demonstrations given and look through the pamphlets and get an idea of the necessity for good and scientifically arranged lighting, without becoming obsessed with the virtues of any particular piece of apparatus or maker.

This society would be delighted to show what it is doing to any British engineers interested in lighting matters.

(To be continued.)

Selected Radio-Telephone Apparatus.

Recent Developments and Improvements.

R.-K. Loud-Speakers.

For nearly two years the R.K. coil-driven loud-speaker manufactured by the BRITISH THOMSON-HOUSTON CO., LTD. (which owns and controls the Rice-Kellogg patents in Great Britain), has occupied a position of merit, its capabilities in respect of volume and purity of reproduction being well known. Much to the regret of those of limited means, however, it has hitherto only been available in cabinet form, complete with its own special amplifier arranged for direct operation from the domestic electricity mains. It is therefore very welcome news that, in addition to the complete instrument, the B.T.-H. Co. is now marketing the R.K. coil-driven loud-speaker units alone, to enable home constructors to build their own complete instruments. The part which can now be obtained through all radio stores (fig. 1) is the actual sound-producing element exactly as fitted to the complete

Fig. 1.—R.-K. Loud-speaker Unit.

R.K. speaker, and may be relied upon to give satisfaction. It is of the electro-magnetic type and is supplied in three forms for operating respectively from 6-volt, 100/120-volt and 200/240-volt sources of supply. The 6-volt unit has a field-current consumption of one ampere and can be fed from either an accumulator, a trickle charger, or a combination of both. The field-current consumption of the 100/120-volt unit is 0.1 amp., while that of the 200/240-volt unit is proportionately less; both the higher-voltage types may be operated, through suitable circuit arrangements, from the electric light mains, a.c. or d.c. A standard B.T.-H. output transformer to the moving coil is embodied in the unit, the input to the transformer and to the field winding being by means of insulated terminals mounted at the back of the unit, which is finished in a pleasing brown colour and has a metal support slotted for mounting on to a baseboard. A baffle of suitable dimensions should be provided to prevent loss of the lower frequencies, due to air circulation between the back and front of the diaphragm. To those who wish to place the unit in a cabinet, it is recommended that the front part of the cabinet be approximately 1 ft. 6 in. square, and in order to prevent resonance in the cabinet and loss of volume due to back pressure, some kind of aperture should be made in the back of the cabinet.

"Pentone" Valves.

The MULLARD WIRELESS SERVICE CO., LTD., is about to release a new type of 5-electrode valve which outwardly resembles a fairly large valve of the ordinary pattern. The electrodes consist of a filament, control grid and anode, connected to the usual 4-pin base, together with two other grids. These are connected, one to the filament (inside the valve) and the other to a small terminal at the side of the base, which corresponds to a screening grid. The remaining grid, placed close to the anode and connected to the filament circuit, is the key to the valve's ability to be used as a power valve. The ordinary screen-grid valve allows only a very small anode swing on the working part of its characteristic curve, due to "secondary emission" from the anode; the fifth electrode of the "Pentone," that is, the grid nearest the anode, neutralises secondary emission and allows a large anode swing to be utilised. Thus it has been possible for the makers to claim a large amplification factor, together with good power-handling capacity. P.M.22 and P.M.24, for 2- and 4-V accumulators, filaments consume 0.3 and 0.15 A respectively. Their amplification factors are stated to be 82 and 62, with a.c. resistances of 62,000 and 28,000 ohms respectively, but not withstanding these large values, output transformers do not appear to be necessary; the permissible anode swing and the anode current are super-power in classification. If a "Pentone" is to be used in a set having

two l.f. stages, one of the latter must be eliminated; otherwise the new valves can be plugged into existing holders, needing only an additional connection between the fifth base terminal and positive anode battery.

Aluminium Cabinets.

In developing a cabinet made of die-cast aluminium for one of the new "Ever-ready" radio receivers which will be placed on the market this summer, the NATIONAL CARBON COMPANY, INC., U.S.A., has moved with the times. Die-cast aluminium is occupying an increasingly important place in the decorative scheme of American homes, combining lightness and an attractive appearance with serviceability. Much of its attractiveness is due to the fact that it can be lacquered in an attractive manner, and it has been used extensively for French telephones, telephone tables, and similar objects, and is now making headway as a material for the manufacture of more standard household furnishings, including tables and chairs. Die-cast aluminium cabinets will not crack, and the hard lacquer surface will not readily scar; cabinets of a uniform grace of design are possible because all are cast from a single mould, and the loud-speaker is also made of die-cast aluminium.

A New Portable Receiver.

A new five-valve portable receiving set has been introduced to the public by the MARCONIPHONE CO., LTD. Model 53 is housed in a walnut cabinet, which is considered to be more suitable for home use than leather, and stronger also. Although of conventional design, the controls have been simplified, there being but one for tuning and one for volume, while a single switch provides a choice of stations operating on wave-lengths between 280 to 550 m., and from 1,000 to 2,000 m.; coils do not have to be changed. A new form of edge dial facilitates adjustment, and a calibration chart is supplied for some of the main British and Continental stations. The loud-speaker is a modified type of Marconiphone cone, the filament accumulator is of the two-volt unspillable sort, of course, and the anode battery is not called upon to furnish more than, say, 7 to 9 mA, at 108 volts, 9 volts grid bias.

Correspondence.

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession.

Electric Wood-working Machines.

In your July 13th issue editorial reference was made to the electrical driving of wood-working machinery.

Whilst it is essential in order to get the electric drive generally adopted that its merits must be extolled, this is by no means the end of the problem.

The best people for the electrical industry to get in touch with are the wood-working machinery manufacturers, since not only will they be required to manufacture electrically-driven tools, but they also are in intimate contact with the industry and are therefore in the best position to propagate the use of the electrically-driven machine-tool. Accordingly their problems should be thoroughly understood.

By an electrically-driven wood-working machine is meant one in which the motors and control gear are an integral part of the machine; the most efficient method of driving the tool is to build the motor directly into the machine, the tool being mounted on the shaft-end of the motor, which may mean several small motors in place of one larger motor, or a line shaft. The a.c. squirrel-cage induction motor lends itself admirably for this purpose, since the rotor and stator can each be manufactured as separate units, the rotor being mounted directly on to the cutter spindle and the stator into the frame-work of the machine. The large proportion of industrial consumers who are still supplied with direct current have to be catered for also, a more difficult problem, since the shaft-end of the motor must be constructed to take the cutters; the driving-end bearing must be larger than usual in order to stand up to the special work; the motor itself must usually be of a special type, smaller in diameter and greater in length than standard machines in order to go into the limited space available. Generally the best type of control gear is either a remotely-controlled contactor mounted in a totally-enclosed cast-iron case and operated by push-button from the operating position, or a push-button starter.

It is, then obvious that the wood-working industry is in need of electrical equipment of a special character, but it is most difficult to persuade an electrical manufacturer to make gear of this nature on a commercial basis. He is not satisfied with the possibility of a big potential market, and usually requires a very large contract in the first instance, at a price which must cover the complete cost of his jigs and fixtures.

When the above-mentioned difficulties have been overcome and the wood-working machinery engineer has managed to purchase the gear, he requires (usually at a cost which causes him to wonder how he is going to manufacture his tool at a reasonable price) he will proceed to design his tools. When they are on the market the delivery of the electrical equipment will be a bugbear. His shops will get congested, due to having machines incompletely assembled through lack of electrical gear. He will have to suffer constant threats of cancellation of orders because (owing to failure to deliver electrical components) he cannot meet his delivery promises and will, perhaps, fall out with some of his best customers.

Again, he will meet with the objection of some electricity supply authorities to the direct-starting of motors of very little more than fractional horse-power output. This will force him in such instances to equip his tool with inefficient starting gear (viewed from an operating standpoint).

Such, then, are some of the worries and difficulties which the progressive wood-working engineer finds himself up against. A good many of them are quite unnecessary and could be removed if the electrical industry would look at the problem in a sympathetic manner from his standpoint, and above all if it would make a serious endeavour to *deliver the goods.*

W. L. Sims,
Electrical Engineer,
MESSRS. WADHIN & CO.

Leicester, *July 23rd*, 1928.

[This letter has been shortened slightly.—EDS. ELEC. REV.]

Past and Present Conditions of Jointing.

By way of answer to "Plumber-Jointer's" letter in your issue of July 20th, dealing, in the first instance, with his show of indignation at this "strong request" (to use his expression with apologies) for an advance to plumber-jointers of 2s. 6d. per hour, and *pro rata*, for jointers and mates, it would be interesting to learn what "Plumber-Jointer" has per hour in palm oil. I presume he has the London N.F.E.A. rate which, at present, I understand to be 1s. 9½d. per hour. Should this, in his opinion, very extravagant advance become an accomplished fact, would he have any objection to acceptance, irrespective of his views, be they red or yellow? I rather think not. I consider that the Knights of the Compound Bucket who have, or have had, experience of the super-tension cable and its jointing, with the heavy work involved, and the ever-present worry whether their work will stand up to test, would not be overpaid at 2s. 6d. per hour, should this advance materialise. Not to mention those jointers engaged on live work in inclement weather, about the only saving grace "Plumber-Jointer's" letter appears to contain. Of course, I have in mind also the quick slap-dab element so prominent in all grades of the industry, whom in most instances are not worth salt to their porridge—and a menace to master and man alike. This element would, I am afraid, be kin to "Plumber-Jointer," as they also would not hesitate to accept any advance so long as someone else took the trouble to secure it for them. A licence, similar to that used by electrical workers in the Southern Hemisphere, as a proof of competence, would speedily remove this class of material spoiler—a long-overdue item worthy of attention. "Plumber-Jointer's" system of costing labour hours for a complete rising main on a consumer's premises is exceedingly interesting. I have yet to learn of a jointer receiving 1s. 11d per hour, excepting, of course, in one of those "Bolshie" boroughs in Greater London. And I do not suppose it is paid without some justification, irrespective of political colour. More like another case of something for nothing, a crook that breaks many backs and tempers, like long-distance telephone joints, yet another case of something for nothing. We who work on supply in the provinces do not get such extravagant money as 1s. 11d. per hour, though we be ever so qualified and skilled craftsmen (not promoted navvies, as is generally the case). Will "P.J." give light on what class of service he dabs in at two per day, as he is none too explicit in the information he gives. Further, where do you get three-yard services nowadays, few and far between on modern building construction. I myself connect every day two complete rising mains, including testing, erection and connection of meters, and I am not on contract or bonus, and not at 1s. 11d. per hour either, and at a saving per service to the supply of 5s. 6d. each. I am using "P.J.'s" costing for erection of meters, and I have meter boards to mount as well.

If "Plumber-Jointer" is so concerned about the cost of connecting consumers, it would behove him to direct his indignation to the nice officials who in many cases take more out of the industry than they put in. So numerous in some supply undertakings that they dare not enter the office all at once, in case they contract consumption; who spend their time picking someone else's brains to keep their comfortable and remunerative billets, to the detriment of qualified engineers out of shop, and electricity tariffs alike.

Cairngorm.

July 23rd, 1928.

Domestic Lighting and Heating and their Influence on Load Factor.

I expect I am very dense, or ignorant, but Mr. E. J. Rutland's letter in your issue of July 20th puzzles me.

He states that the flexible of a certain vacuum cleaner became frayed at the point where it entered the plug, and then the wires became severed and had to be pushed together to enable the current to flow. All this led to "the inevitable short-circuiting and destruction of the armature."

How on earth could a short in a vacuum cleaner flexible destroy the armature of the vacuum cleaner?

A. J. Abraham.

Bexley Heath, *July 24th*, 1928.

I read with astonishment Mr. E. J. Rutland's letter in your issue of July 20th. My experience is apparently different from that of Miss C. Haslett quoted therein. I find women enlightened individuals who appreciate the great benefits electricity can confer and, excepting the fetish of the coal fire, are quite ready to adopt electrical appliances in the home. The great barrier to their more widespread adoption is the cost of electricity.

The "regrettable incidents" referred to by your correspondent are much more likely to be due to the use of inferior foreign insulating materials than inexperience, or rough handling, on the part of the operators. The moral of these incidents is that manufacturers of electrical appliances should realise that it is a "penny wise and pound foolish" policy to buy inferior insulating materials, however "cheap" they appear to be. If manufacturers would use first-class British insulating materials, the few accidents which do occur would be still fewer.

I hope manufacturers of electrical apparatus will *not* adopt Mr. Rutland's suggestion respecting the attachment of tags. If the advice given above is followed, no such tags will be necessary. Imagine, Sir, the local gas company attaching tags to cookers warning housewives not to use the cooker when the tap is worn out! Electrical appliances should be, and *can* be, made as "fool-proof" as gas appliances if good materials and sound design are adopted in their manufacture.

H. C. C. C. Silver.

Wallington, *July 27th*, 1928.

House-Wiring Specifications.

The letter from "Old Hand" published on July 20th is decisive in its opposition to the issue of loosely-worded specifications in connection with the wiring of Council houses and small property generally, and constructive in its references to the earthing of domestic apparatus.

I feel that it is essential in the highest interests, not merely of the electrical contractor, but also of the consumer, that publicity should be given to every advance which tends towards greater efficiency in design and economy in this section of the industry. Consequently, the first clause, which deals with cables and junction boxes, of "Old Hand's" specification might be expanded to include single, twin, or triple conductors insulated and sheathed in one operation with "Lecite" compound. One big advantage of this type of cable is that the design promotes speedy erection, and thus materially reduces the labour item in the cost of wiring. Moreover this system can now be installed with an integral earth wire ready to hand for the earthing of domestic apparatus at any part of the cable run. A full description of the cables and accessories comprising the system was given on page 260 of the Electrical Review of February 10th, 1928.

A. Hughes,
Technical Engineer,
Liverpool Electric Cable Co., Ltd.

Liverpool, *July 25th*, 1928.

"Earthing" and the Public.

In this vexed controversy (recently accentuated by a fatal accident) how often has the contractor been criticised and blamed when, for many reasons, he is not to blame!

In the first place, any private person can go to an electrical showroom and purchase a vacuum cleaner, a domestic iron, a kettle, etc., sometimes at list price, but often at trade price, and be invariably supplied with 2-strand flex and a lampholder adapter ready connected; the customer goes home and unconcernedly plugs it into a lampholder and carries on in ignorance of any danger.

Surely this alone shows that the supply houses and manufacturers are to blame! So long as manufacturers continue to supply, illustrate, and advertise these articles as being capable of connection to any existing lampholder, the danger will continue to exist. On the other hand, if every piece of such apparatus were turned out with 3-strand flex and proper earthing terminals were provided, they would go far towards eliminating the danger.

Even if a contractor wishes to do what his judgment tells him is safe, he often has great difficulty in efficiently earthing each exposed metal part of a vacuum cleaner, or an iron, because the manufacturer has made no provision for so doing. What a boon it would be to contractor, consumer, and electricity supply authorities if a really good three-pin switch-plug, made in three or four different sizes, were adopted as a recognised national standard. It would benefit everyone, except the individual manufacturers who are making their own patterns and patent plugs.

There is not yet a really ideal, faultless, and fool-proof switch-plug on the market. I thought I had found a really good one a short time ago, but, although it was listed as a 15-ampere plug, when I attempted to break a circuit of 10 amperes, it set up and maintained a contact arc which, of course, would have been stared at in inactive horror by the average consumer, until the contacts had burnt away. The result is that the ever doubtful human element has to be depended on to turn off the switches on a radiator before breaking the circuit at the plug.

E. S. Fardon.

Stockport, *July 25th*, 1928.

Electricity Supply.

May I be allowed to draw attention to a few anomalies in connection with electricity supply? Manchester owns the most economically operated supply station in the Kingdom, and yet a resident can write to the local paper pointing out that the charge for lighting there is higher than in other towns where the supply stations do not hold the record for low generating costs. Then, again, the North-East Coast district is stated to have the most up-to-date power stations and system of distribution in the country, upon which the National scheme is said to have been largely modelled. Yet, as a matter of fact, the rate for lighting in Newcastle is 6d. per unit, and that in Manchester is, I understand, 5d. Compared with these, the charge in Birmingham is 4½d., 4d. in other places, and only 3d. in Shrewsbury.

Incidentally, the unfortunate farmers and other people in the neighbourhood of the Barton station and, I understand, other super-power stations, are up in arms on account of the damage to the vegetation and personal discomfort resulting from the sulphurous fumes discharged from the chimneys of the power station there. It was ruled that the Barton station, being a public utility authorised by Parliament, was privileged to spoil the neighbourhood in this way, as the nuisance is a matter of necessity.

But is such a state of things inevitable? If small stations, such as that at Shrewsbury can supply electricity at such a low rate as 3d. for lighting and 1d. for small quantities used for power, cooking and heating, and without doing damage to the countryside, why are such small stations being shut down instead of being encouraged to develop on up-to-date and economical lines as they should be, so long as they can deliver electricity at lower rates than the bulk-supply stations with their heavy distribution costs and overhead charges?

Again, is not the reason why the charge for lighting is so high in some of the towns where the power demand is proportionately large, that the supply stations cut their rates to prevent the installation of independent power plant, and endeavour to recoup themselves by overcharging unfortunate small consumers for lighting and other domestic purposes, and for power?

In the long run economic facts are bound to prevail. Is not a position likely to develop similar to that which obtains at the present time with our railways? Road vehicles which, like independent power plant, are free from encumbrances and heavy establishment and distribution charges are making things very awkward for the railways.

Small Consumer.

July 26th, 1928.

Installation Costs.

Your correspondents, Messrs. Mortimer & Gall, complain bitterly because they have, perhaps, fortunately for them, lost a screwed-conduit job at £1 per point. (Why *will* London contractors persist in this "per point" talk?) Without knowing of the job in question, it is impossible to deal with the probable cost, and your correspondents are silent as to their own price. Obviously, in business premises with a number of lamps spaced at intervals of a few inches and controlled by very few switches, many of the "points" will not reach £1 in cost.

Mr. W. H. Crowe, however, attempts to lay down figures for an "average point," though the instance he takes of a 24-ft. run, using only 40 ft. of wire, is a curious and questionable one. Taking the net cost of his own items, *viz.*, 24 ft. ¾ in. h.g.s. w. tubes, 4 universal boxes, with 1 switch, 1 ceiling rose, 1 c.g. holder (all Tucker) and 40 ft. 3/.029 "Nonazo" cable, the cost is about 11s. 3d., not 15s. 5½d. as he states.

These figures do not include "overheads," as he deals separately with these.

(Incidentally, Mr. Crowe rather confuses his grades of wire: he bases his figures on "Nonazo" and then states that 2,500-meg., 3/.029 Association cable costs 14s. more. The difference is £3 19s. 4d., not 14s. If he is comparing 600-megohm and 2,500-meg. Association cable, the difference is 13s. It has not been 14s. since May 3rd. He should keep his costs up-to-date.)

Messrs. Mortimer & Gall think the price cutter they refer to is a philanthropist. Mr. Crowe calls him a "spare-time man," or "non *bona-fide*." How, then, will they describe some of the best known and largest firms of London contractors in

the light of the figures you publish in the same issue, of the tenders for installations at the L.C.C. school at Clapham and the Town Hall at Hackney? Both of these authorities are known for their strict specifications and little, if any, scope is available for "wangling"; indeed, the very names of the majority of the firms quoting are sufficient warranty against any such procedure. Yet, in the former case, nine tenderers vary from £1,149 to £1,616 and, in the latter, eight firms vary from £465 to £745, *i.e.*, a difference of 40 per cent. and 60 per cent. respectively, between the highest and lowest; surely a very much larger difference than the profit even the highest tenderers could have hoped for. It is a curious and somewhat significant coincidence that in the case of the Hackney job the price quoted by the Corporation's own department for wiring its own Town Hall is exactly the average of all the tenders.

These figures indicate that there is "something wrong," much more emphatically than your correspondent's £1 per point case, and the writer ventures to make a suggestion which, if acted upon, might do incalculable good to the whole industry. Will the highest and the lowest tenderers, and the firm quoting nearest to the average of all the tenders in each of these cases, get together and analyse frankly and thoroughly the figures on which their tenders were based; and, having done so, publish the results to the industry, if possible with a criticism by a qualified accountant? A frank interchange of views on these lines has before now proved to be of the greatest value, and might easily lead to the strongest movement yet initiated to deal with the vexed question of price-cutting. The lessons to be learned from such an investigation would be as valuable to those making so public spirited an effort as to the industry generally.

E. Arthur Pinto.

Ramsgate, *July 25th*, 1928.

Parliamentary News.

[By Our Special Parliamentary Reporter.]

Rural Overhead Lines.

On July 24th, Mr. Hurd asked the Minister of Transport whether he was aware that the Worcestershire, Shropshire and Staffordshire Power Co. had selected for electric lines some of the most beautiful sections of its area, although there were other routes which could be selected without seriously spoiling the countryside; and whether he would invite the Members of Parliament representing those counties to confer with him and the company in order to do no more than the inevitable damage to the beauty of the country.

Colonel Ashley said that Mr. Hurd did not state the precise locality which he had in mind. The company to which he referred had generally succeeded in arranging routes for its overhead lines to which no objection had been taken. If, however, objection was taken in any particular case, it would have to be determined by him in accordance with the provisions of the Electricity (Supply) Acts, and in the case of disputed applications for wayleaves it was his duty to have regard to the effect on the amenities of the land of the proposed lines.

Mr. Hurd asked the Minister of Transport if he would give the name of the Royal Academician whom he was inviting to advise as to the high standards and other erections to be distributed over rural England in connection with the new schemes of electrification, and the terms of his engagement.

Colonel Ashley said he was informed that the Central Electricity Board had appointed Sir Reginald Blomfield, M.A., R.A., to advise it on questions arising in connection with the design and colouring of the towers for carrying transmission lines. He had no information as to the methods or the terms of remuneration

The Cable-Radio Report.

The report of the Imperial Wireless and Cable Conference was to be presented to the House of Commons yesterday (Thursday). Its contents are outlined elsewhere in this issue.

Published Specifications.

Compiled expressly for this journal by a firm of Chartered Patent Agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings taken.

1926.

32,814. "Gasfilled electric rectifiers." H. Wade (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). December 28th, 1926. (293,327.)

1927.

5,875. "Gasfilled electric discharge tubes." H. Wade (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). March 2nd, 1927. (293,365.)

5,989. "Application of electric spark for television purposes." W. Dawson and D. M Milner. March 3rd, 1927. (293,474.)

6,275. "Dynamo-electric machines." Central Electric Development Co., Ltd., and T. S. Jones. March 7th, 1927. (293,475.)

8,972. "Electric measuring instruments." H. Butler. April 1st, 1927. (Cognate application 33,061/27.) (293,402.)

9,304. "Electrical switches." W. Symes and Metropolitan-Vickers Electrical Co., Ltd. April 4th, 1927. (293,372.)

9,240. "Indication at a distance of the direction of a magnetic field." L. Levy. April 3rd, 1926. (268,835.)

9,373. "Means for operating hot cathode electrical discharge tubes." H. B. Gough and Watson & Sons (Electro-Medical), Ltd. April 5th, 1927. (293,376.)

9,376. "Electric cooking and heating apparatus." C. R. Belling. April 5th, 1927. (293,405.)

9,445. "Method and means for determining optimum current strength in the electrodeposition of rubber and other substances." Dunlop Rubber Co., Ltd., and F. H. Lane. April 6th, 1927. (293,343.)

9,524. "Ignition systems for internal-combustion engines." C. S. Franklin and A. W. Whistlecroft. April 6th, 1927. (293,481.)

9,584. "Electrical reproduction of sound from records." L. H. Pearson and C. Marshall. April 7th, 1927. (293,483.)

9,641. "Electrical contact relays." Electrical Research Products, Inc. July 24th, 1926. (274,815.)

9,720. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd., J. E. Ostline, and R. Taylor. April 8th, 1927. (293,486.)

9,729. "Circuit arrangements for relaying current impulses over telephone lines." L. Mellersh-Jackson (Telefonaktiebolaget L. M. Ericsson). April 8th, 1927. (Convention date not granted.) (269,889.)

10,084. "Method of removing gases from and cleaning the surfaces of metals in vacuums by electrical means." J. Von Bosse. March 7th, 1927. (286,632.)

10,096. "Magnetic cores." Standard Telephones & Cables, Ltd. September 11th, 1926. (277,289.)

10,170. "Mercury-vapour lamps." R. H. Houston and E. N. Pringle. April 13th, 1927. (293,496.)

10,257. "Electric heating apparatus for hot-water circulating systems or the like." J. C. Carnegie. April 14th, 1927. (293,500.)

10,525. "X-ray installations." S. G. S. Dicker (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). April 19th, 1927. (293,503.)

10,632. "Electrical generating and propelling apparatus for airplanes and other vehicles." G. A Wilson. April 20th, 1927. (293,505.)

10,977. "Dynamo-electric machines." J. C. Macfarlane and W. A. Mac farlane. April 25th, 1927. (293,508.)

11,692. "Method of and means for supporting transmission line conductors." Aluminum Co. of America and T. Varney. May 2nd, 1927. (293,515.)

13,365. "Terminal assemblies for telephone exchanges." Siemens Bros. and Co., Ltd., and C. Lambert. May 18th, 1927. (Addition to 270,834.) (293,527.)

14,027. "Safety arrangements for overhead electric conductors." Electrical Improvements, Ltd., and E. A. Logan. May 25th, 1927. (293,533.)

14,866. "Arrangement and connection for electric hoisting apparatus connected to three-phase distribution systems." Sachsenwerk Licht-und Kraft Akt.-Ges. and E. Gossow. June 2nd, 1927. (293,542.)

15,795. "Acoustic devices, such as loud-speakers." Electric Research Products, Inc. August 4th, 1926. (275,571.)

17,625. "Electric signalling devices for use in mines." Sterling Telephone and Electric Co., Ltd., F. G. Bell, and S. W. Richards. July 2nd, 1927. (293,566.)

17,731. "Automatic traffic-signal timing switches." Crouse-Hinds Co. August 25th, 1926. (276,631.)

18,228. "Electric cooking and heating apparatus." C. R. Belling. April 5th, 1927. (Divided application on 293,405.) (293,570.)

19,807. "Jointing members for mercury-vapour apparatus." General Electric Co., Ltd., and E. Weintraub. July 27th, 1926 (275,233.)

21,197. "Cascade arrangement of an induction motor and a commutator shunt machine, with an additional resistance in the rotor circuit." Akt.-Ges. Brown, Boveri et Cie. August 19th, 1926. (276 328.)

21,211. "Electric coupling devices for railway vehicles." Westinghouse Air Brake Co. February 24th, 1927. (285,862.)

22,097. "Cooling arrangements for dynamo-electrical machines." O. T. Blathy. August 22nd, 1927. (Addition to 285,845.) (293,590.)

24,760. "Light-operated electric switch." R. W. Armstrong and I. E. McCabe. September 20th, 1926. (277,711.)

26,604. "Electric welding apparatus." Wilson, Welder & Metals Co., Inc. November 8th, 1926. (280,175.)

28,093. "Synchronous amplifying control mechanism." Bethlehem Steel Co. January 8th, 1926. (Divided application on 264,148.) (279,498.)

28,694. "Synchronous amplifying control mechanism." Bethlehem Steel Co. January 8th, 1926. (Divided application on 264,148.) (279,499.)

29,082. "Signalling apparatus for motor vehicles." T. G. McKay and R. M. Robertson. November 1st, 1927. (293,616.)

34,045. "Apparatus for recording and reproducing telephone conversations and messages." K. V. Vogel and J. G. Larsson. December 17th, 1926. (282,426.)

1928.

414. "Methods of phantomisation for telephone circuits." A. Marino. January 7th, 1927. (283,217.)

974. "Pneumatically-operated controlling mechanism for electric motors." International General Electric Co., Inc. January 12th. 1927. (283,526.)

2,207. "Means for fastening glass caps or covers on the base-plates of electricity meters." Landis & Gyr Soc. Anon. February 21st, 1927. (285,807.)

2,475. "Preparing electrical resistances from ceramic material." Dr. M. Hauser. April 26th. 1927. (Divided application on 11,195/27.) (293,632.)

3,195. "Electromagnetic clutches." P. Forster. February 1st, 1928. (293,655.)

4,784. "Dynamo-electric machine rotors" British Thomson-Houston Co., Ltd. February 17th, 1927. (285,458.)

5,451. "Asynchronous motor corrected by means of a frequency-changer." Maschinenfabrik Oerlikon. February 28th, 1927. (286,221.)

11,322. "Caps for electric incandescent lamps and the like." General Electric Co., Ltd. (Patent Treuhand Ges. für Elektrische Gluhlampen). April 17th, 1928. (Addition to 285,009.) (293,675.)

Trade Mark Applications.

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from July 25th :—

Edna. No. 490,311. Class 8. Electric vacuum cleaning machines, electric fans, &c.—G. J. White, trading as the Edna Electric Vacuum Cleaner Co., 91, Moorgate Street. E.C.2

Orion Gold. No. 484,656. Class 8. Electrical apparatus.—Magyar Wolfram Lampa Gyar Kremenezky Janos Reszventarsasag, Budapest. (British representatives: Dicker, Pollack & Mercer, 20 23, Holborn, E.C.1.)

Delta. No. 489,228 Class 8. Electric dry cells and batteries.—Falk, Stadelmann & Co., Ltd., 83-93, Farringdon Road, E.C.1.

Venus. No. 489,731. Class 8. Electric dry batteries.—W. G. Cleland, trading as Cleland & Co., 20, High Holborn, W.C.1.

Selebritone. No. 491,264. Class 8 Radio-telephonic instruments, &c.—S. Harris, 15, Great Ducie Street, Manchester.

Sun-Glo. No. 488,762. Class 13. Lamp reflectors.—Edison Illuminating, Ltd., 64, Queen Victoria Street, E.C.4.

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

BEESTON (Notts.).—Soap factory for Boots' Pure Drug Co., Ltd.; Bromley & Watkins, architects, Prudential Buildings, King Street, Nottingham.

BILLINGHAM.—School extensions (£19,000); Durham County Education Committee.

BIRMINGHAM.—Church, Yardley Wood Road; trustees, Church of Christ. Church, Broadgates Road and Coventry Road; Wesleyan Methodist trustees. Infant welfare centres, Birches Green and Billesley Farm Estate; Medical Officer of Health. Garages, shops, &c., Dalton Street (£5,000); Kean & Scott, Ltd.

BLACKBURN.—Catholic college, for St. Mary's College, Shear Bank Road; principal.

BLACKPOOL.—Telephone exchange, North Shore, for H.M.O.W.; Head Post Office, Blackpool.

BOURNEMOUTH.—Public baths (£40,000), for the T.C.; borough surveyor.

BRIGHTON.—Housing scheme, Whitehawk Road (about 200 houses); borough engineer. 30 houses, Coombe Road; Braybons, Ltd. Cinema and restaurant, East Street; Savoy Cinemas, Ltd.

BROMLEY (Kent).—New St. Andrew's Church (£12,000); Sir Charles Nicholson, architect.

BURSLEM.—Alterations, Palace Cinema; licensee.

CANTERBURY.—Junior King's School, Sturry; Sydney Tatchell and Geoffrey C. Wilson, architects; Trollope and Colls, builders, Coleman Street, London, E.C.

CATERHAM.—Extensions, nurses' home (£7,126); Carrington, Thomas & Co., Ltd., Beckenham.

CHADDERTON.—Electric light installation, Stanley Road and Eustace Street Schools, for the E.C.; A. W. Cox, U.D.C. surveyor.

CHESTERFIELD.—Extensions to offices, for the B.G.; W. A. Derbyshire, architect, 30, Gluman Gate (returnable deposit of £1 1s.).

CLACTON-ON-SEA.—Rebuilding station (£80,000), for the London & North-Eastern Railway Co.; engineer.

COUNDAN.—New schools (£17,000); Durham County Education Committee.

CROYDON.—Additional 278 houses, for the T.C.; borough surveyor.

DONCASTER.—Alterations and additions, Hamilton Lodge Maternity Home (applications by August 7th); F. Oscar Kirby, Assoc.M.Inst.C.E., borough engineer, 2, Priory Place.

DUNDALK.—Harbour works; P. H. McCarthy, engineer, 26, Lower Leeson Street, Dublin.

EDINBURGH.—Dye-house, &c., at Slateford, for Scottish Dyers and Printers, Ltd.; the manager.

GLASGOW.—210 houses for Corporation at Maryhill; Director of Housing.

GLOSSOP.—Power house, Howard Street; Glossop Printers, Ltd.

HANFORD.—170 houses, Corporation Estate; Bolsover Building Co., Beighton, near Sheffield.

HIGH WYCOMBE.—Additional 200 houses, for the T.C.; borough surveyor. Factory extensions, Gibbons & Tilbury, Copyground Lane, and Furniture Industries, Conegra Farm.

HOLBROOK (Suffolk).—Royal Hospital school (£700,000), for the Admiralty; Buckland & Haywood, architects, Birmingham; J. Gerrard & Sons, builders, Swinton, Manchester.

HULL.—Clinic, Holderness Road (about £10,000); C. Greenwood & Son, builders.

IRISH FREE STATE (Dublin).—Warehouse, Custom House Docks, for Port and Docks Board; Board's engineer, East Wall.

KIDDERMINSTER.—Offices and showrooms, Birmingham Road, for W. R. & R. Adam, carpet manufacturers. Block of shops, Worcester Street, for the Co-operative Society; secretary.

KIPPEN (Stirling).—Alterations and additions to Sandyholes for Major Stirling. Alterations and additions to Dun Eaglais, for Sir D. Y. Cameron.

LEWES.—Isolation wards, &c., Chailey Institution, for the B.G.; E. H. Fuller, architect, 19, High Street (returnable deposit of £1 1s.).

LLANDUDNO.—Conversion Elgin House to flats, Vaughan Street; Imperial Hotel, Ltd.

LONDON (E.C.).—Two blocks buildings, site of 140, Bishopsgate and 77-84, Houndsditch; Richardson & Gill.

LONDON.—*Continued.*

(Barking, E.).—Factory extensions, Hertford Road; Medcraft Bros.

(Poplar, E.).—Additions, Premier Sack Works, Stour Road; W. Figg.

(Stepney, E.).—Tenements, Holland Estate (£41,800); L.C.C. architect.

(West Ham, E.).—Secondary school, Plaistow (£38,867), for the Borough E.C.; Director of Education.

(Islington, N.).—Central and junior schools, St. George's area; L.C.C. Education Committee.

(S.E.).—New wing, County Hall (£661,500); L.C.C.

(Bellingham, S.E.).—Houses (32), for the London C.C.; Triangular Construction Co., Ltd., builders, East Molesey.

(Camberwell, S.E.).—Dwellings, Comber Estate (£42,000); L.C.C. architect.

(Deptford).—Reconstruction of pumping station (£70,000); Metropolitan Water Board; J. H. Truewick & Son, 38, Parliament Street, quantity surveyors.

(Lewisham, S.E.).—Extensions, Colfe Grammar School; Governors.

(Southwark, S.E.).—Church, Camberwell Road; E. Maufe, for Wesleyan trustees.

(Clapham, S.W.).—Maternity home, Grove Road; Wandsworth medical officer of health.

(Fulham, S.W.).—Offices at Macfarlane, Lang & Co.'s biscuit works, Townmead Road; J. M. Monroe & Son. Nurses' home, Fulham workhouse, Fulham Palace Road; Prestige & Co. Building for Darracq Motor Works; H. Roffey & Sons.

(Kensington, S.W.).—Elementary school, Bevington Road (£23,215); Leslie & Co., Ltd.

(Putney, S.W.).—Alterations 'bus garage, High Street; L.G.O.C.

(Wandsworth, S.W.).—Additions, Gambrell Bros. works, Merton Road; Castle & Sons.

(Westminster, S.W.—Extensions, technical institute (£53,500); L.C.C. Education Committee.

(Wimbledon, S.W.).—Additions, Huntley & Sparks warehouse, Deburgh Road; A. C. Huntley. Billiard hall, Haydons Road; Jas. Burgess & Sons, Ltd.

(Paddington, W.).—Remodelling, Droop Street School (£17,500); L.C.C. Education Committee.

(St. Pancras, W.C.1.).—Extensions, Central London Throat, Nose and Ear Hospital, Wicklow Street; Governors.

MIDDLESBROUGH.—Additional 200 houses, for the T.C.; borough surveyor.

NEWBURY.—Extensions, St. Bartholomew's grammar school; trustees.

NORTON.—90 houses, Cornhill site, for Stoke Corporation; Eadie Towers & Co., Wolverhampton.

PERTH.—Alterations and extensions at County Buildings £40,000); county clerk, Perth.

REIGATE.—Housing scheme (24), for the R.D.C.; William J. Hatton, surveyor, 48, High Street, (returnable deposit of £3 3s).

RHYL.—School, Victoria Road, and extension at County School, Grange Road; Director of Education, County Education Authority.

ROTHERHAM.—Business premises, Bridgegate, for the T.C.; borough engineer (returnable deposit of £1 1s).

ST. ALBANS.—Nurses' home, Hill End mental hospital, for Herts. C.C.: H. Carter Pegg, architect, 35, Parliament Street, S.W. (returnable deposit of £1).

SELBY (Yorks.).—Housing scheme (32), for the U.D.C.; surveyor.

SHILDON.—Secondary school; Durham County Education Committee.

SMETHWICK.—Cinema to replace Coliseum; Mr. Hewitson. Works extensions; Henry Hope & Sons, Ltd.

SOUTHEND-ON-SEA.—Cinema, for the Plaza Cinema, Ltd., Southchurch.

STOKE ALBANY (Market Harborough).—Re-erection of Park Farm, residence of Lady Charles FitzRoy.

SWINDON (Wilts.).—Housing scheme (100), Hurst estate, for the T.C.; J. B. L. Thompson, borough surveyor.

TAMWORTH.—Council offices, council chamber, and depôt for the R.D.C.; H. L. Kent, surveyor, 29, Lichfield Street (returnable deposit of £3 3s).

TEDDINGTON.—School extensions (£9,379), for Middlesex E.C.; W. S. Try, builder, Uxbridge.

THRYBERGH.—Housing scheme (40), for Rotherham R.D.C.; surveyor.

TYNEMOUTH.—Alterations, Tramway offices, John Street, Cullercoats; Tynemouth and District Tramway Co.

WARRINGTON.—Schools, Bewsey and Alder Lane, for the Borough E.C.; Wright and Hamlyn, architects.